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AOIPS 3 User's Guide

Volume II: Program Descriptions

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AOIPS 3 User's Guide

Volume II: Program Descriptions

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CHAPTER 1

DOCUMENT OVERVIEW

This document is Volume II of the Atmospheric and Oceanographic Information Processing System (AOIPS) User's Guide. Volume II presents a detailed description of every AOIPS program. It is intended to serve as a reference for such items as program functionality, program operational instructions and input/output variable descriptions.

Volume I of the AOIPS User's Guide is intended to serve as a general reference to the AOIPS system. Refer to this volume for further details.

Chapters 2 through 5 present program descriptions for the satellite, radar, aircraft, and utility programs respectively. Each chapter is divided into sections that follow the chapter organization of Volume I. Programs are listed alphabetically within each chapter section.

Program descriptions are derived from the on-line help information. Each program description is divided into two sections. The FUNCTIONAL DESCRIPTION section describes the purpose of the program and contains any pertinent operational information. The PROGRAM DESCRIPTION section lists the program variables as they appear on-line, and describes them in detail.

CHAPTER 2

SATELLITE DATA PROCESSING

2.1 Geosynchronous Satellite Processing

PROGRAM GARS

Convert GARS Version 3.0 & 4.0 Tapes to AOIPS formatted tape

FUNCTIONAL DESCRIPTION

GARS converts a GARS version 3.0 or a GARS version 4.0 tape to an AOIPS formatted tape.

PROGRAM DESCRIPTION

GARS TUTOR

PARAMETER -----	DESCRIPTION -----
INTAPE	Input tape drive name (MTAO: or MFAO:)
OUTAPE	Output tape drive name (MTAO: or MFAO:)
ODENS	Output tape density (800, 1600, 6250)
MODE	File processing mode (MANUAL or AUTOMATIC)
STRTFIL	First file processed (NULL for AUTOMATIC)
NUMFILES	Number of files processed (NULL for AUTOMATIC)

INTAPE is the drive name for the GARS input tape.
The valid names are "MTAO:" or "MFAO:".

OUTAPE is the drive name for the converted GARS tape.
The valid names are "MTAO:" or "MFAO:".

ODENS is the tape density for the converted GARS tape.
Valid densities are "800", "1600", or "6250" bpi.

MODE defines the file processing mode. Valid modes
are "AUTOMATIC" or "MANUAL".

"AUTOMATIC" mode means all VISSR files on the tape will
be processed and if an additional tape is required the user
will be prompted for another output tape.

"MANUAL" mode means the user may specify the starting file
on the input tape to be processed and the total number
of files to be processed.

STRTFIL is the first file to be processed.

NUMFILES is the total number of files to be processed.

VAS BAND SELECTION AND OUTPUT FIELD TYPE DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
BANDS	Bands to be processed
NUM_BAND	Number of bands to process
FIELD	Output field name

BANDS are the VAS bands. Valid values are from 1 to 12.

NUM_BANDS is the total number of bands to be processed.

FIELD is the field type that will be written to the AOIPS/2 tape. Valid field types are:

"GREY", the output AOIPS/2 tape will have the grey (byte) values and AOIPS/2 images can be generated directly from the tape.

"RADIANCE", the output AOIPS/2 tape will have the radiance (real) values and AO2RDS has to be run to generate a radiance dataset disk file.

The VAS DYNAMIC TUTOR converts a GARS VAS tape to the AOIPS/2 format and stores the data as grey (byte) or radiance (real) values.

PROGRAM HRANAL

Hurricane Analysis Package

FUNCTIONAL DESCRIPTION

HRANAL plots a polar grid on a satellite image and performs a statistical analysis. The statistical analysis includes the display of statistics such as the mean, standard deviation, minimum and maximum grey value and/or black body temperature for a selected area of grid. Also a grey level and/or temperature histogram can be plotted or written to a file. An area of the grid can be specified as either a ring, sector or region. A region is defined as sector bound by two rings. Any type of GOES satellite image can be used as long as it has the proper AOIPS navigation.

PROGRAM DESCRIPTION

HRANAL TUTOR

PARAMETER -----	DESCRIPTION -----
DIRECTRY	Directory location for images being referenced.

DIRECTRY is the AOIPS group location where the images for analysis are located. This location is also used for the output print file GRDSTAT.PRT which is created by an option in the IIS button board interface.

Select a satellite image file for analysis from the displayed IAT IMAGE SELECTION LIST.

HURRICANE ANALYSIS GRID PARAMETERS DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
NRINGS	Number of grid rings
NSECTS	Number of grid sectors
ROTANG	Grid rotation angle (deg)
DELRNG	Range between rings (KM)
CLDHGT	Cloud height (KM)
GPLANE	Grid graphics plane
HPLANE	Histogram graphics plane
MINHST	Minimum histogram bin value
MAXHST	Maximum histogram bin value
BINSIZ	Histogram bin size
FIELD	Histogram field name
PLTDEV	Histogram plot device

NRINGS specifies the number of rings (navigated range circles) for the grid. Rings are numbered from the center outward.

NSECTS specifies the number of equal angle grid sectors. Sectors are numbered from the due north (zero rotation angle) increasing clockwise.

ROTANG specifies the grid rotation angle clockwise in degrees.

DELRNG specifies the distance in kilometers between each grid ring.

CLDHGT specifies the cloud height in kilometers that the grid is remapped to account for the satellite parallax.

GPLANE specifies the graphics plane number of the grid.

HPLANE specifies the graphics plane number of the histogram plot.

MINHST allows specification of up to 5 minimum bin values for the histogram. The specified values **MUST** match the selected field type e.g., BBT. The histogram can have up to 5 different bin sizes. If more than one bin size is desired the **MINHST** value should equal the preceding **MAXHST** value for a proper continuous histogram. For example, to have a histogram go from 190 to 250 by 10 and then 250 to 290 by 20, specify :

```
MINHST(1) - 190
MINHST(2) - 250
MAXHST(1) - 250
MAXHST(2) - 290
BINSIZ(1) - 10
BINSIZ(2) - 20
```

MAXHST allows specification of up to 5 maximum bin values for the histogram. The specified values must match the field type, e.g., BBT. The histogram can have up to 5 different bin sizes. If more than one bin size is desired the **MAXHST** value should equal the next **MINHST** value for a proper continuous histogram. For example, to have a histogram go from 190 to 250 by 10 and then 250 to 290 by 20, specify :

```
MINHST(1) - 190
MINHST(2) - 250
MAXHST(1) - 250
MAXHST(2) - 290
BINSIZ(1) - 10
BINSIZ(2) - 20
```

BINSIZ specifies the bin size for each of up to 5 ranges the histogram can have.

FIELD specifies the field name for the histogram. The **FIELD** can either be the raw grey values (**GREY**) or black body temperature (**BBT**).

PLTDEV specifies the plot device for the histogram plot.
II specifies the plot will be in the IIS graphics plane.
QM specifies the plot will go to the QMS laser printer.

The **HURRICANE ANALYSIS GRID PARAMETERS DYNAMIC TUTOR** allows the specification of grid and other parameters necessary for the grid analysis of satellite images. The size and number of grid regions can be modified by specifying the number of grid rings and sectors and the range between rings. If parameters pertaining to the grid are altered, the grid must be re-drawn and the statistics re-computed. In addition, several histogram parameters can be modified to output histogram with different characteristics

including histogram minimum, maximum, bin size and field.

The following IIS button menu appears after the HURRICANE ANALYSIS GRID PARAMETERS DYNAMIC TUTOR is invoked. This interface controls the major functions of the program.

	A	B	C	D	F
3	Reselect image	Toggle grid	Toggle histogram	Clear graphics	Exit
2	Select sector and or ring	Reselect input parameters	Plot histogram		Help
1	Define grid by lat/lon	Define grid by cursor	Display selected statistics	Output Statistics	Draw grid & compute statistics

HURRICANE ANALYSIS BUTTON MENU

1A: Define Grid by Lat/Lon

Defines the center of the grid by specification of the latitude and longitude (ddmmss). The grid center must be defined before the grid is drawn.

1B: Define Grid by Cursor

Defines the grid center by the current location of the cursor. The latitude and longitude is displayed to the CRT after the grid center is defined. The grid center must be defined before the grid is drawn.

1C: Display Selected Statistics

Displays statistics for a selected area of the grid to the CRT. Both grey level and black body temperature statistics are displayed. The Select sector and/or ring must be pressed before this function can operate.

1D: Output Statistics

All grid area statistics including histograms are written to a file that can be printed later. The name of the file is GRDSTAT.PRT and it is located in the current AOIPS group.

1F: Draw Grid and Compute Statistics

Draws the specified polar grid and computes and stores all grid region statistics for subsequent calculations. The grid center must be defined before this function can operate.

2A: Select Sector and/or Ring

Defines by the current cursor location the sector and ring for displaying of statistics and plotting histogram. The grid must be defined and drawn for this function to operate.

2B: Reselect Input Parameters

Allows the re-specification of grid and other user parameters by invoking the HURRICANE ANALYSIS GRID PARAMETERS TUTOR

2C: Plot Histogram

Plots a percentile of total pixels histogram for a selected grid region. Either a grey level or temperature bin range histogram can be plotted. The grid area must be selected (Select Sector and/or Ring) before this function can operate.

2F: Help

Lists help information to the CRT concerning the IIS button functions.

3A: Reselect Image

Presents the IAT IMAGE SELECTION LIST to select another image for analysis.

3B: Toggle Grid

Toggles the grid graphics plane on or off.

3C: Toggle Histogram

Toggles the histogram graphics plane on or off.

3D: Clear Graphics

Clears the graphics planes for the grid and histogram.

3F: Exit

Terminates the program.

PROGRAM JAPTAP

Convert a GMS Formatted Tape to an AOIPS/2 Formatted Tape

FUNCTIONAL DESCRIPTION

JAPTAP converts a GMS formatted tape to an AOIPS/2 formatted tape.

PROGRAM DESCRIPTION

JAPTAP TUTOR

PARAMETER -----	DESCRIPTION -----
INTAPE	Input tape drive name (MTAO: or MFAO:)
OUTAPE	Output tape drive name (MTAO: or MFAO:)
IDENS	Input tape density (800, 1600, 6250)
ODENS	Output tape density (800, 1600, 6250)

INTAPE is the drive name for the input GMS tape.
The valid names are "MTAO:" or "MFAO:".

OUTAPE is the drive name for the converted GMS tape.
The valid names are "MTAO:" or "MFAO:".

IDENS is the tape density for the input GMS tape.
Valid densities are "800", "1600", or "6250".

ODENS is the tape density for the converted GMS tape.
Valid densities are "800", "1600", or "6250".

PROGRAM LMEDIT

Edit Landmark Data

FUNCTIONAL DESCRIPTION

LMEDIT is used to add, modify, delete, or print landmark data. The default is the active navigation/landmark file.

PROGRAM DESCRIPTION

LMEDIT TUTOR

PARAMETER -----	DESCRIPTION -----
INSTRU	Instrument name
FILNUM	Landmark file number

INSTRU is the instrument name corresponding to the landmark data. Valid names are: "EVISSR", "WVISSR", "SMS", "METSAT", "GMS", and "VAS".

FILNUM is the landmark data file number.

The following non-TAE menu will appear after the tutor:

**** LANDMARK EDITING ****

- | | | |
|-----------|----------|---------|
| 1. MODIFY | 3. ADD | 5. EXIT |
| 2. DELETE | 4. PRINT | |

A list of the landmarks will follow this menu.
Enter appropriate function number to perform task.

1. MODIFY

Allows modification of the current contents of a specific landmark number.

2. DELETE

The following non-TAE menu will appear:

**** LANDMARK EDITING - DELETE LANDMARK RECORDS**

1. DELETE ONE LANDMARK RECORD
2. DELETE LANDMARK RECORDS WITH THE SAME ID
3. DELETE CONSECUTIVE LANDMARK RECORDS
4. DELETE ALL LANDMARK RECORDS
5. EXIT (DEFAULT)

Choose the appropriate option for the task at hand.

3. ADD

Allows the addition of a landmark by editing the items by hand.

4. PRINT

Prints the list of landmark statistics.

5. EXIT

Exit this task.

PROGRAM LMLIST

Compare Current Navigation with Landmark File

FUNCTIONAL DESCRIPTION

LMLIST is used to list a set of landmark statistics statistics which have been compared with the current navigation solution on a specified device.

PROGRAM DESCRIPTION

LMLIST TUTOR

PARAMETER -----	DESCRIPTION -----
DEVICE	Output device type

DEVICE is the name of the output device used to list the landmark statistics. The valid values are: "(T)ERMINAL" and "(P)RINTER".

If PRINTER is selected, the output will go to the device specified by the AOIPS/2 global F\$PRINT. This global may be changed running the proc PRINTER.

PROGRAM LMREG

Select Landmarks from Registered Images

FUNCTIONAL DESCRIPTION

LMREG defines satellite coordinates (line and pixel) as known Earth coordinates (latitude, longitude, and height) for an aligned series of images.

An image directory listing is presented. Enter the names of the images in the aligned series containing the landmarks of interest.

The following IIS button board will appear after the tutor:

	A	B	C	D	F
3	Loop Images	Increase Loop Speed	Cursor On/Off		Exit
2	Stop Loop	Decrease Loop Speed			Help
1					Define

LMREG BUTTON MENU

1F: Define

Define a landmark point. Enter the latitude, longitude, and height of the earth location identified by the cursor.

2A: Stop Loop

Stop the image loop.

2B: Decrease Loop Speed

Decrease the current loop speed by 1/5 second.

2F: Help

Displays this help for the button menu.

3A: Loop Images

Loop forward with the selected images.

3B: Increase Loop Speed

Increase the current loop speed by 1/5 second.

3C: Cursor On/Off

Turn the active cursor on and off.

3F: Exit

Exit the button board and the LMREG program.

PROGRAM LMZOOM

Ingest Landmark Images From AOIPS/2 Formatted Tape

FUNCTIONAL DESCRIPTION

LMZOOM creates image files from the AOIPS/2 formatted tapes without the need of a navigation solution. LMZOOM should be used if the nominal solution is of poor quality. These "landmark" image files may then be used to align geographical points used to improve a navigation solution.

PROGRAM DESCRIPTION

LMZOOM TUTOR

PARAMETER	DESCRIPTION
-----	-----
TAPEDRV	Tape drive name(s)
NTAPES	Number of tapes
ZOOMFAC	Absolute image zoom factor
IMGDESC	Image description

TAPEDRV is assigned the name(s) of the tape drive(s) that will be used in the LMZOOM process. Valid tape drive names are "MTAO:" and "MFAO:". Two tape drives may be used to alternatively process the data.

NTAPES is the total number of the AOIPS/2 tapes to be processed.

ZOOMFAC is the pixel zoom factor relative to satellite image resolution. The default for landmark images is 4. The valid zoom factors include: -4,-2,1,2,4,8.

IMGDESC is an 8 character descriptor of the zoomed image. This description will be stored in the image directory.

PROGRAM NVCFIL

Create New Navigation/Landmark Files

FUNCTIONAL DESCRIPTION

NVCFIL creates a new navigation file for the instrument specified by the parameter INSTRU.

The new navigation file automatically becomes the current navigation file, and the instrument specified by INSTRU automatically becomes the current instrument. If an instrument is specified that does not already have a navigation file associated with it, then a new navigation file will be created. A new landmark file corresponding to the navigation file is also created.

This task should be executed before attempting to generate a new navigation solution. If this is not done, the generated solution becomes a part of the active navigation file.

PROGRAM DESCRIPTION

NVCFIL TUTOR

PARAMETER -----	DESCRIPTION -----
INSTRU	Valid instrument names (EVISSR, WVISSR, SMS, METSAT, GMS, VAS)
NAVDES	Navigation description (max. of 128 characters)

INSTRU is the instrument name used to construct the navigation file name. Valid instrument names are: "EVISSR", "WVISSR", "SMS", "METSAT", "GMS", and "VAS".

The default value is the current instrument.

NAVDES is the description of the new navigation file.

PROGRAM NVCURSOR

Navigated Cursor

FUNCTIONAL DESCRIPTION

NVCURSOR is used to navigate a selected image by a chosen transformation mode.

Select up to 4 images from the image list.

The following non-TAE menu will appear after the tutor:

** NAVIGATED CURSOR **

- | | | |
|-------------------------|---|---------------------------------------|
| 1. | * | 1. IMAGE PIXEL, LINE TO EARTH COORDS. |
| 2. | * | 2. EARTH LAT., LONG. TO IMAGE COORDS. |
| 3. | * | 3. HORIZON PIXELS ON GIVEN LINE |
| 4. | * | 4. SUBSATELLITE POINT COORDINATES |
| 5. KEYBOARD ENTRY | * | 5. ENTER MASTER COORDINATES |
| 6. CHANGE CLOUD HEIGHT. | | |
- INPUT ITE YRDAY HH:MM:SS PIXEL LINE LAT. LONG.

SELECT IMAGE AND TRANSFORMATION TYPE (DEFAULT-REPEAT WITH NEW POINT). MAKE NEXT SELECTION AFTER EACH DISPLAY OF RESULTS, OR ENTER E TO EXIT.

The following IIS button board will also appear after the tutor:

	A	B	C	D	F
3	Set cursor position				Exit
2					
1					

NVCURSOR BUTTON MENU

3A: Set cursor position

Defines the cursor position.

3F: Exit

Exit button board and NVCURSOR program.

There are six transformation modes available in NVCURSOR. Enter the image number and the appropriate transformation mode (i.e. 1,2 is image 1 and mode 2).

MODE 1: Move the cursor to the location using the trackball and define. Latitude and longitude are output.

MODE 2: Enter latitude and longitude for the desired location. The cursor will move to the location on the image.

MODE 3: Gives horizon pixels on a given line.

MODE 4: Outputs subsatellite point in Earth and satellite coordinates.

MODE 5: Enter the master line and pixel for the desired location. The cursor will move to the location on the image.

MODE 6: Enter transformation mode only (no image). Then enter cloud height as a decimal. The input cloud height becomes the default value while the NVCURSOR task is being executed.

Output to the line printer can be obtained by entering a third number after the transformation mode (example: 1,2,1).

Keyboard Entry (image name 5) allows the user to obtain information without an image by entering the mode using the keyboard.

PROGRAM NVDFIL

Delete Navigation/Landmark File(s)

FUNCTIONAL DESCRIPTION

NVDFIL deletes any number of navigation files and landmark files from an instrument directory.

PROGRAM DESCRIPTION

NVDFIL TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP INSTRU	Location of navigation files Instrument names

INGROUP specifies the location (disk and directory) of the navigation files (i.e. USER:[PIERCE.AOIPS.DEMO])

INSTRU is the instrument name. The default value is the current instrument. The valid names are: "EVISSR", "WVISSR", "SMS", "METSAT", "GMS", and "VAS".

PROGRAM NVDISP

Display Current Navigation Instrument, File, and Solution

FUNCTIONAL DESCRIPTION

NVDISP displays the active navigation instrument file, and solution.

PROGRAM NVDSOL

Delete Navigation Solution(s)

FUNCTIONAL DESCRIPTION

NVDSOL deletes any number of navigation solutions from the active navigation file.

PROGRAM DESCRIPTION

NVDSOL TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Location of navigation files
INSTRU	Instrument name
NVFILENO	Navigation file number

INGROUP specifies the location (disk & directory) of the navigation files. (i.e. USER:[PIERSE.AOIPS.DEMO])

INSTRU is the instrument name. The valid names are: "EVISSR", "WVISSR", "SMS", "METSAT", "GMS", and "VAS".

NVFILENO is the navigation file number used to specify the navigation file from which solutions will be deleted.

PROGRAM NVGEN

Generate Navigation Solution

FUNCTIONAL DESCRIPTION

NVGEN generates a nominal navigation solution from the line documentation data stored in the Master Tape File (MTF). The nominal navigation solution can then be improved by fitting landmarks and/or editing the satellites orbit and attitude control parameters.

PROGRAM DESCRIPTION

NVGEN TUTOR

PARAMETER -----	DESCRIPTION -----
DUMP	Dump current navigation solution
DEVICE	TERMINAL or PRINTER
NVBAND	Band of data

DUMP is used to specify whether the current navigation solution is to be listed to the device specified by the parameter DEVICE. Valid values are: "(Y)ES" or "(N)O".

DEVICE is the device that will be used to list the current navigation solution. The valid output devices are: "TERMINAL" and "PRINTER".

NVBAND is the type of data used for landmarking in the derivation of the navigation solution. The default is "VI" (visible). Other valid bands are: "IR" and "NA".

The following non-TAE menu will appear after this tutor:

**** NAVIGATION SOLUTION GENERATION OPTIONS ****

1. GENERATE NOMINAL SOLUTION
2. REFINE CURRENT SOLUTION BY FITTING LANDMARKS
3. GENERATE SOLUTION BY EDITING CONTROL PARAMETERS
4. UPDATE CURRENT SOLUTION
5. CHANGE VISIBLE-IR OFFSETS IN THE CURRENT SOLUTION

The following is a brief description of the five navigation options available and the most common paths taken when generating a navigation solution.

1. GENERATE NOMINAL SOLUTION

This option generates a navigation solution based on the available LDC only. If a Chebyshev solution is being generated, accept all LDC data from the "MASTER TAPE FILE" list of available LDC and default through the menus. If a Keplerian solution is being generated, first select option 3. From the "EDIT CONTROL PARAMETERS" menu change the orbit type (option 2) to Keplerian(1). Then select option 1 (GENERATE NOMINAL SOLUTION) and accept only one LDC time from the LDC list and default through the menus.

The following summary and continuation options menu will then appear:

```
+++++
+
+                ** NAVIGATION SOLUTION NO. 3 **                +
+ NAVIGATION DAY      86180 NO. OF LANDMARKS -          0+
+ ORBIT TYPE          -    CHEB ORBIT SOURCE      -      MDF+
+ ATTITUDE SOURCE     - NOMINAL LINE SHIFT SOURCE -      MDF+
+ PIXEL SHIFT METHOD - HORIZON PIXEL SHIFT SOURCE-LANDMARK+
+ W. CHI-SQ. PER FREEDOM (LIN/PIX/TOT) - 0.00/ 0.00/ 0.00 +
+
+++++
```

CONTINUATION OPTIONS:

1. ACCEPT AND STORE (DEFAULT)
2. REJECT AND EXIT
3. REVISE NAVIGATION CONTROL PARAMETERS

Selection of continuation option 1 will cause the generated navigation solution to be stored and become active. If continuation option 2 is selected the navigation solution will be rejected. Finally, continuation option 3 allows the solution to be revised by editing the control parameters (see comments on option 3).

2. REFINE CURRENT SOLUTION BY FITTING LANDMARKS

This option refines the current solution by using landmark data from the landmark file. As in option 1, the MDF list (list of LDC) is presented and depending on the orbit type selected, the LDC are chosen for the generation of the solution. Next, the option is given to flag any landmarks that may be in question. The acceptance codes are:

- 0 - no flag (Accept)
- 1 - flag pixels only (Use line only)

- 2 - flag lines only (Use pixel only)
- 4 - flag both pixels and lines (reject)

The navigation solution is generated and a summary of the navigation solution is presented with the landmark statistics. The continuation option menu is also presented (as in option 1), but with a fourth option, "DISPLAY FULL LANDMARK LIST". This list is similar to the one generated by the function LMLIST.

3. GENERATE SOLUTION BY EDITING CONTROL PARAMETERS

This option uses LDC and landmark data, as well as allowing the editing of control parameters for a better solution. The following non-TAE menu will appear:

** EDIT CONTROL PARAMETERS **

- 1. ORBIT/ATTITUDE SOURCE (1-INPUT,2-MDF) - 2.
 - 2. ORBIT TYPE (1=KEP,2-CHEB) - 2.
 - 3. ATTITUDE AND LINE SHIFT CONTROL CODE - 1.
(1-NOMINAL,2-FREE ATT,3-FREE ATT AND LINE)
 - 4. NOMINAL LINE SHIFT SOURCE (1-INPUT,2-MDF,3-MDF+BIAS)- 2.
 - 5. PIXEL SHIFT COMPUTATION METHOD - 1.
(0=GAMMA SHIFT,1-HORIZON SHIFT,2-RHO BIAS)
 - 6. GAMMA SHIFT SOURCE(0-NO,1-INPUT,2-LANDMARK GROUPING)- 0.
HORIZON SHIFT OR RHO BIAS CONTROL PARAMETERS
 - 7. TIME DEPENDENCE CONTROL CODE (0-NO,1-INPUT,2-FREE) - 0.
 - 8. BREAK TIME (HOUR OF DAY) - 1000.0000
 - 9. DEGREE OF FIT FOR INTERVAL 1 (0-CON,1-LIN,2-QUAD) - 1.
 - 10. DEGREE OF FIT FOR INTERVAL 2 (0-CON,1-LIN,2-QUAD) - 1.
 - 11. LINE DEPENDENCE CONTROL CODE (0-NO,1-INPUT,2-FREE) - 0.
 - 12. LANDMARK UNCERTAINTIES IN LINES (MIN.=0.1) - 1.00
 - 13. LANDMARK UNCERTAINTIES IN PIXELS (MIN.=0.1) - 1.00
 - 14. VISIBLE-IR LINE OFFSET (VISIBLE LINES) - 0.
 - 15. VISIBLE-IR PIXEL OFFSET (VISIBLE LINES) - 0.
- ENTER INDEX, NEW VALUE (UP TO 6 PAIRS). HIT RETURN TO KEEP CURRENT VALUES.
ENTER -1 TO EXIT

After modifying the appropriate parameters, the "MASTER TAPE FILE" list of LDC will be presented. Continue as in option 2 (REFINE CURRENT SOLUTION BY FITTING LANDMARKS).

Comment:

If the line residuals are fine but there is trouble with the pixels, try the following:

- 1) Set the control parameters 7 (TIME DEPENDENCE CONTROL CODE) to a value of 2 and 11 (LINE DEPENDENCE CONTROL CODE) to a value of 1.

- 2) Set all the bias parameters to 0.
- 3) Run the task and accept the solution no matter how bad it looks.
- 4) Go back to the control parameters using this new solution and set 7 to 1 and 11 to 2.
- 5) Do not change the bias parameters and run the task again.

Other comments:

Multiply the "Pitch Misalignment in Degrees" by 728.35 to obtain the pitch misalignment in visible lines.

4. UPDATE CURRENT SOLUTION

This option allows the current (active) solution to be regenerated and updated into the current directory. This option follows a similar path as option 2.

5. CHANGE VISIBLE-IR OFFSETS IN CURRENT SOLUTION

This task allows the input of the offset (line and pixel) between visible and infrared images so that NVZOOM may be done with the images in alignment.

To compute VIS/IR offsets:

- 1) Perform a 1:1 VIS/IR zoom using NVZOOM on the area of interest.
- 2) Align VIS with its respective IR using the ALIGN task.
- 3) After noting the offsets, reverse the sign before entering it into the navigation via the navigation option 5 (CHANGE VIS/IR OFFSETS).

Comment:

If using an existing VIS/IR pair:

If the visible image has a negative zoom factor (i.e. -8, -4, -2), then multiply the offsets by the factor and reverse the sign. Example: A -2:1 VIS/IR zooms offset after aligning is -13 pixels and -3 lines.

Example:

2 X -13 = -26 Enter +26 pixels
2 X -3 = -6 Enter 6 lines

If the visible image has a positive zoom factor
(i.e. +8,+4,+8) divide the offset by the factor and change
the sign.

PROGRAM NVGLBL

List Navigation Management System Global Variables

FUNCTIONAL DESCRIPTION

This procedure lists the current contents of the Navigation Management System global variables.

PROGRAM NVLDOC

Collect Line Documentation

FUNCTIONAL DESCRIPTION

NVLDOC collects satellite orbital parameters from tape or disk, which are then used in the generation of a navigation solution.

PROGRAM DESCRIPTION

NVLDOC TUTOR

PARAMETER -----	DESCRIPTION -----
INSTRU	Instrument name
SOURCE	Data source (TAPE or DISK)
TAPEDRV	Starting tape drive name Other tape drive name (optional) Valid = (MTAO:,MFAO:)

INSTRU is the valid instrument name corresponding to the proper directory. The valid names are: "EVISSR", "WVISSR", "SMS", "METSAT", and "GMS".

SOURCE is the source of the LDC data ("TAPE" or "DISK").

TAPEDRV is the valid tape drive ("MTAO:" and/or "MFAO:").

If two tape drives are to be used, enter both valid tape drive names ("MTAO:" and "MFAO:"). The first tape drive name entered, will be the first tape processed. Tape drives will then alternate until the task is completed.

If only one tape drive is available, enter the tape drive name. If multiple processing is desired the tape drive will unload and wait for the next tape to be loaded.

COLLECT LINE DOCUMENTATION DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
MODE	Processing mode P = process, D = dump, PD = process and dump.
SCAN	Scan setting mode (MANUAL,AUTOMATIC)
START	Starting scan number
END	Ending scan number
NREAD	Consecutive scans to be read
NSKIP	Consecutive scans to be skipped

MODE is the processing mode. Valid processing modes are:

- "P" = process only,
- "D" = dump only (send satellite orbital parameters
to the line printer),
- "PD" = process and dump.

SCAN is the scan mode. Valid values are: "MANUAL" and
"AUTOMATIC" (default).

START is the starting scan number.

END is the ending scan number.

NREAD is the number of consecutive scans to read.

NSKIP is the number of consecutive scans to skip.

The LINE DOCUMENTATION COLLECTION DYNAMIC TUTOR is
a continuation of the collection of satellite orbital
parameters (NVLDOC).

PROGRAM NVLINK

Link Navigation Solution to Images

FUNCTIONAL DESCRIPTION

NVLINK links any number of images to the current navigation file by setting the navigation link fields in each image label.

Select the images from the displayed image directory.

PROGRAM NVLIST

List Active Navigation Solution

FUNCTIONAL DESCRIPTION

NVLIST lists the active navigation solution on a specified output device. The list includes:

- Control parameters
- Orbit/attitude parameters
- Chebyshev parameters (Groups 1 and 2)
- Bias parameters
- Horizon offset parameters
- Landmark residuals

PROGRAM DESCRIPTION

NVLIST TUTOR

PARAMETER	DESCRIPTION
-----	-----
DEVICE	Output device type

DEVICE is either "(T)ERMINAL" or "(P)RINTER"

If DEVICE is "(P)RINTER" it will be sent to the the device specified in the AOIPS/2 global variable F\$PRINT. This global can be changed with the Proc PRINTER.

PROGRAM NVR SOL

Restore Navigation Solution(s)

FUNCTIONAL DESCRIPTION

NVR SOL restores, by removing the delete flag, any number of navigation solutions in the current navigation file.

PROGRAM NVSDIR

Select an Instrument Directory

FUNCTIONAL DESCRIPTION

NVSDIR selects an instrument directory to become the active instrument directory.

PROGRAM DESCRIPTION

NVSDIR TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Location of navigation files

INGROUP specifies the location (disk & directory) of the navigation files (i.e. USER:[PIERCE.AOIPS.DEMO]).

PROGRAM NVSFIL

Select a Navigation File

FUNCTIONAL DESCRIPTION

NVSFIL selects a navigation file to become the active navigation file.

PROGRAM DESCRIPTION

NVSFIL TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Location of navigation files

INGROUP specifies the location (disk & directory) of the navigation files (i.e. USER:[PIERCE.AOIPS.DEMO]).

PROGRAM NVSSOL

Select a Navigation Solution

FUNCTIONAL DESCRIPTION

NVSSOL selects a navigation solution from the active navigation file and instrument directory.

PROGRAM DESCRIPTION

NVSSOL TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Location of navigation files
INSTRU	Instrument name
NVFILENO	Navigation file number

INGROUP specifies the location (disk & directory) of the navigation files (i.e. USER:[PIERCE.AOIPS.DEMO]).

INSTRU is the instrument name. The valid names are: "EVISSR", "WVISSR", "SMS", "METSAT", "GMS", and "VAS".

NVFILENO is the navigation file number specifying which navigation file will be selected.

PROGRAM NVZOOM

Zoom GOES Images Using Active Navigation

FUNCTIONAL DESCRIPTION

NVZOOM creates "zoomed" GOES satellite image files from digital data contained on an AOIPS/2 formatted tape.

PROGRAM DESCRIPTION

NVZOOM TUTOR

PARAMETER	DESCRIPTION
-----	-----
TAPEDRV	Tape drive name(s)
NTAPES	Number of AOIPS tapes to be processed
STFILE	Number of first file to be processed per tape
NFILES	Number of files to be processed per tape
BAND	Data band(s) to be processed "VI", "IR", or "BOTH"
ZOOMFAC	Absolute image zoom factor
IMGDESC	Image description (8 chars)
COORType	Type of the center coordinates
LINLAT	Center Y-coordinate of output image
PIXLON	Center X-coordinate of output image (neg. for west long.)
INSTRU	Navigation instrument code
NAV_FILE	Navigation file number

TAPEDRV is assigned the name(s) of the tape drive(s) that will be used in the NVZOOM process. Valid tape drive names are "MTAO:" and "MFAO:". Two tape drives may be used to alternatively process the data.

NTAPES is the total number of the AOIPS/2 tapes to be processed.

STFILES is the number of first file to be processed per tape.

NFILES is the number of files to be processed per tape.

BAND specifies the band(s) of the master AOIPS/2

image to be zoomed. Valid values are: "VI"(visible), "IR"(infrared), or "BOTH".

ZOOMFAC is the absolute pixel zoom factor relative to the satellite image resolution. For example, to create full resolution (1 KM) GOES images, the zoom factor should be set to 1. If both VI and IR images are to be zoomed, specify the zoom factor with respect to visible image. The corresponding IR zoom factor is calculated in the program. The default zoom factor is 1. The valid values include: -4, -2, 1, 2, 4, 8.

IMGDESC is an 8 character descriptor of the zoomed image. This description will be stored in the image directory.

COORTYPE is either the earth coordinate system or the satellite image (master) coordinate system used to specify the center coordinates of the output image(s). The valid values include: "EARTH" for earth coordinates (latitude and longitude) and "SATELLITE" for satellite coordinates (master line and pixel).

LINLAT is the center Y-coordinate, either the satellite line number or the latitude (DDMMSS).

PIXLON is the center X-coordinate, either the satellite pixel number or the longitude (DDMMSS). West longitude is a negative value.

INSTRU is a 6 character instrument code for the set of images. Valid instrument codes are: "EVISSR", "WVISSR", "METSAT", "GMS", "SMS", and "VAS".

NAV_FILE is the navigation file number containing the active navigation solution to be used to generate the zoomed images.

PROGRAM ODSAP

Convert ODIS Formatted Tape to AOIPS/2 Formatted Tape

FUNCTIONAL DESCRIPTION

ODSAP converts the ODIS formatted tape to an AOIPS/2 formatted tape.

PROGRAM DESCRIPTION

ODSAP TUTOR

PARAMETER	DESCRIPTION
-----	-----
INTAPE	Input tape drive name (MTAO: or MFAO:)
OUTAPE	Output tape drive name (MTAO: or MFAO:)
IDENS	Input tape density (800, 1600, 6250)
ODENS	Output tape density (800, 1600, 6250)
TYPE	Type of ODIS tape
BEGSEG	Start data segment number
ENDSEG	End data segment number

INTAPE is the drive name for the input ODIS tape.
The valid names are "MTAO:" or "MFAO:".

OUTAPE is the drive name for the converted ODIS tape.
The valid names are "MTAO:" or "MFAO:".

IDENS is the tape density for the input ODIS tape.
Valid densities are "800", "1600", or "6250".

ODENS is the tape density for the converted ODIS tape.
Valid densities are "800", "1600", or "6250".

TYPE is the ODIS tape conversion type, where
3 - ODIS3 in aoips1 and 4 - ODIS4 in aoips1.

BEGSEG is the data segment number to start processing.

ENDSEG is the data segment number to end processing.

ODIS OUTPUT WINDOW SPECIFICATION DYNAMIC TUTOR

PARAMETER	DESCRIPTION
ISPIX	Input start pixel # (*)
INPIX	Number of input pixels (*)
ISLIN	Input start line # (*)
INLIN	Number of input lines (*)
MODE	Data mode (*)
HCODE	Horizontal coverage code (*)
SPIX	Starting pixel number
NPIX	no. of output pixels (*)
SLIN	Starting line number
NLIN	no. of output lines (*)

ISPIX is the input start pixel number.

INPIX is the number of input pixels.

ISLIN is the input start line number.

INLIN is the number of input lines.

MODE is the data mode.

HCODE is the horizontal coverage code.

SPIX is the starting pixel number.

NPIX is the number of output pixels.

SLIN is the starting line number.

NLIN is the number of output lines.

The ODIS WINDOW SPECIFICATION DYNAMIC TUTOR allows the selection of the desired output data by an output window defined by the starting pixel and/or line number.

ODIS DATA SEGMENT DATE DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
SEGMENT	Data segment number (*)
MODE	Data type (*)
DATE	Segment date (YYMMDD)
TIME	Scan time (*)

SEGMENT is the data segment number that will be processed.

MODE is an integer used to define the resolution and type of ODIS satellite data to be processed. Values for **MODE** are:

- 1 - 2 mile IR only
- 2 - 2 mile IR and 1 mile visible
- 3 - 2 mile IR and 2 mile visible
- 4 - 2 mile IR and 3 mile visible
- 5 - 0.5 mile visible only

DATE is the date (YYMMDD) of the data segment.

TIME is the scan time (HHMM).

The ODIS DATA SEGMENT DATE DYNAMIC TUTOR sets the ODIS data segment date.

PROGRAM REAL2IM

Create an AOIPS Image From Real-Time Satellite Data

FUNCTIONAL DESCRIPTION

REAL2IM extracts an AOIPS image from the real-time satellite data file. The extracted image can be displayed in IAT memory, stored to disk, or both. In addition, AOIPS line documentation files can be optionally created to store necessary navigation information to subsequently run AOIPS navigation software. REAL2IM allows the extraction of visible, IR, or MSI VAS channel. Zooms or reduces relative to the real-time dataset can be specified.

PROGRAM DESCRIPTION

REAL2IM TUTOR

PARAMETER	DESCRIPTION
-----	-----
DISKDIR	AOIPS group where real-time data is stored
IMGDIR	AOIPS group where real-time images/navigation is written
FILNAME	Real-time satellite file name
BAND	(IR,VIS, or MSI)
DSLINE	Starting dataset line
DSPIXEL	Starting dataset pixel
ZOOMFAC	Absolute Zoom factor
MATCHVIS	Flag to Match IR to Visible image
LINEDOC	Flag to store navigation into AOIPS line doc files
DEVICE	Output device for extracted image
IMGDES	Image description
IMGSNM	Image short name
ANNOT	Write annotation (date/time) to image flag (YES or NO)
APXOFF	Annotation pixel offset
ALNOFF	Annotation line offset
ANNVAL	Annotation grey value
EXTGRD	Write grid to image flag (YES or No)
GRDVAL	Grid grey value

DISKDIR is the node/disk/directory location of where the real-time data file is located. An example might be MV2::DUC1:[PDQ].

IMGDIR is the AOIPS group location where the extracted images and line documentation files are to be stored. An example might be DUC1:[AOIPS2TST.AOIPS.REAL].

FILNAME is the name of the real-time file from which the AOIPS image is extracted.

BAND is the desired satellite channel to extract. "VIS" is the visible channel. "IR" is the normal VISSIR IR channel (VAS channel 8). "MSI" indicates that one of the channels provided in the MSI mode is desired. The program will present the available MSI channels for

selection.

DSLINE is the dataset start line desired for the beginning of the extracted AOIPS image.

DSPIXEL is the dataset start pixel desired for the beginning of the extracted AOIPS image.

ZOOMFAC is the zoom/reduce factor relative to the dataset desired for the extracted AOIPS image. Positive values indicate a zoom, negative values indicate a reduce relative to the dataset. If the **MATCHVIS** parameter is set to "YES", **ZOOMFAC** is relative to the full resolution visible pixel for (IR and MSI only).

MATCHVIS specifies whether the parameter **ZOOMFAC** is to be relative to the full resolution visible pixel for IR or MSI. For example, if **MATCHVIS** is set to "YES", and **ZOOMFAC** is - 2, then the extracted IR image resolution will match a visible image with a reduce factor of two. Thus the IR image will be zoomed to have an output resolution of 2 kilometers.

LINEDOC specifies whether AOIPS line documentation files are generated for the extracted images. The line documentation files are used by the **NVGEN** software to generate AOIPS navigation. Only unique line documentation will be added to the line documentation files.

DEVICE specifies the output device(s) where the extracted image is to be displayed or stored. "IAT" specifies that the image is to be stored in the IAT refresh memory only. "DISK" specifies that the extracted image is to be cataloged as an AOIPS disk image. "BOTH" indicates that the extracted image is to be displayed in IAT refresh memory and stored on disk.

IMGDES is the image description that is stored in the extracted image label for information purposes only.

IMGSNM is the image short name that is stored in the extracted image label for information purposes only.

ANNOT is a flag which if set to "YES" will annotate (engrave) the image date and time into the image.

APXOFF is the number of image pixels from the right edge of the image where the annotation will begin.

ALNOFF is the number of image lines from the bottom edge of the image where the annotation will begin.

ANNVAL is the grey value that will be used for the annotation.

EXTGRD is a flag which if set to "YES" will extract the political boundary and lat/lon grid from the realtime dataset and write it into the image

GRDVAL is the grey value used for the grid in the image.

PROGRAM REALSCH

Schedule Real-Time Satellite Data

FUNCTIONAL DESCRIPTION

REALSCH allows the scheduling of inputs for the satellite real-time ingest software. REALSCH accesses the real-time schedule file which controls the various ingest parameters as a function of date and time. The schedule file is copied over from the real-time node. Upon normal exit of REALSCH, the updated schedule file is copied back to the real-time node. The dataset region (window) to ingest can be specified by entering the dataset window coordinates directly, by entering the center latitude or longitude, or by defining a box on a navigated satellite image.

PROGRAM DESCRIPTION

REALSCH TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	AOIPS group location for navigated images

DISDIR is where the navigated images reside. These images are used when specifying the dataset window by center latitude and longitude, or by using a box on an image to define the dataset region.

PROGRAM REDUCE

Create Reduced Satellite Image(s) from an AOIPS/2 Formatted Tape

FUNCTIONAL DESCRIPTION

REDUCE creates GOES satellite image files at a reduced resolution from digital data contained on an AOIPS/2 formatted master tape.

PROGRAM DESCRIPTION

REDUCE TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Tape drive names (MTAO:,MFAO:)
NTAPES	Number of tapes
STFILE	Number of first file to be processed per tape
NFILES	Number of files to be processed per tape
METHOD	Image reduce method (AVERAGE, SAMPLE)
IMGDESC	Image description (8 character max.)
INSTRU	Instrument code
BANDS	Data bands (VI, IR, BOTH)
NAVLINK	Navigation file link

TAPEDRV is assigned the name(s) of the tape drive(s) that will be used in the Master Reduce process. Valid tape drive names are "MTAO:" and "MFAO:". If two tape drive names are entered, the processing will alternate between TAPEDRV(1) and TAPEDRV(2).

NTAPES is the total number of AOIPS/2 GOES tapes to be processed.

STFILE is the number of the first file to be processed per tape.

NFILES is the number of files to be processed per tape.

METHOD specifies which method is used to create the reduced resolution image(s). The following are valid

values for METHOD:

"AVERAGE" produces a reduced resolution image by an averaging and rounding technique.

"SAMPLE" produces a reduced resolution image by sub-sampling lines and pixels.

IMGDESC is an 8 character descriptor of the reduced resolution image. This description will be stored in the image directory. IMGDESC is a required parameter.

INSTRU is a 6 character instrument code for the set of master images. Valid instrument codes are: "EVISSR", "WVISSR", "METSAT", "GMS", "SMS", and "VAS".

BANDS specifies the band(s) of the master AOIPS/2 image to be reduced. Valid values are: "VI"(visible), "IR"(infrared), or "BOTH".

NAVLINK is the link to the navigation file. The default value is the current navigation file number. Set NAVLINK to 0, if the reduced image is not to be linked with a navigation file.

PROGRAM REXTRACT

Procedure For Automatic Extraction of Real-time Satellite Images

FUNCTIONAL DESCRIPTION

REXTRACT is a procedure that can be run in batch which will automatically extract AOIPS images from the appropriate real-time files and store the images to disk.

To specify or change the user inputs to REAL2IM, tutor REAL2IM in the normal interactive mode and save the user inputs using the TAE SAVE command SAVE REALIR for IR band extraction user inputs, and SAVE REALVIS for visible band extraction user inputs. These parameter files are restored by REXTRACT each time it invokes REAL2IM to extract IR and visible images.

To change the time window for extracting visible images, tutor EXTSCH interactively and save the time window to the parameter file EXTSCH by using the TAE save command SAVE EXTSCH. This parameter file is restored by REXTRACT before it attempts to extract visible images.

To change the amount of time after each half hour before REXTRACT attempts to extract images, tutor EXTPAUSE and save the amount of minutes desired by using the TAE command SAVE EXTPAUSE. This parameter file is restored by REXTRACT each time.

To run REXTRACT in TAE batch mode, enter TAE command mode and type REXTRACT |RUNTYPE=BATCH|. This command will cause REXTRACT to be submitted as a batch job.

PROGRAM SRCALIB

Stereo Image Calibration

FUNCTIONAL DESCRIPTION

SRCALIB calibrates a stereo image pair. The remapped image will be shifted against the base (unremapped) image to align a feature of known height. The offset of the remapped image will then be the difference between the amounts of actual shift and that of theoretical shift. The new image offset of the remapped image will be stored in the image label when accepted.

PROGRAM DESCRIPTION

SRCALIB TUTOR

PARAMETER -----	DESCRIPTION -----
IMGNAME	Name of the IAT stereo pair

IMGNAME is the name of an existent stereo configuration. Both the base image and the remapped image must have been dropped in the refresh memories. If a valid configuration name is not provided, select one from the IAT image/configuration list.

The following IIS button menu appears after the top level tutor is invoked:

	A	B	C	D	F
3	Locate Landmark	View Stereo Image	View Base Image	View Remapped Image	Exit
2	Increase Loop Speed	Decrease Loop Speed	Cursor On/Off	Graphics On/Off	Help
1	Reset Shifts	Shift Image	Reset Cursor	Move Cursor	Define

SRCALIB BUTTON MENU

1A: Reset Shifts

Resets the shifts in the remapped image.

1B: Shift Image

Shifts the remapped image to align the landmark with the base image.

1C: Reset Cursor

Resets the cursor to the center of the screen.

1D: Move Cursor

Sets the cursor to move mode to select a landmark.

1F: Define

Defines the new calibration by writing the shifts into the remapped image label.

2A: Increase Loop Speed

Increases the loop speed between the base and remapped images.

2B: Decrease Loop Speed

Decreases the loop speed between the base and remapped images.

2C: Cursor On/Off

Toggles the cursor on and off.

2D: Graphics On/Off

Toggles the graphic planes on and off.

2F: Help

Provides help information on the IIS buttons.

3A: Locate Landmark

Defines a landmark of known height at the cursor location.

3B: View Stereo Image

Views the stereo image pair configuration.

3C: View Base Image

Views the base image.

3D: View Remapped Image

Views the remapped image

3F: Exit

Exits the program.

The steps to calibrate a stereo image pair are:

- 1) Move cursor to the feature of known height.
- 2) Enter height of that feature. It will cause a shift of the remapped image.
- 3) Loop stereo images and shift the remapped image until that feature appears stationary.
- 4) Push the define button to store the offset in the image label of the remapped image.

PROGRAM SRCREATE

Create a Stereo Cloud Height Contour

FUNCTIONAL DESCRIPTION

SRCREATE creates contours on a stereo image pair by connecting the points of the same height. The remapped image is shifted according to the given cloud height. The cloud features of that height will appear stationary on the alternated stereo images. A contour will then be formed and displayed on the graphics memory by subsequently connecting these features. The contour can be smoothed using a third order polynomial fitting technique.

PROGRAM DESCRIPTION

SRCREATE TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input Image Group

INGROUP is the name of the image group where the base image and remapped image files are located. The current image group in the TAE global parameter F\$FILLOC is provided as the default. Because of file protection against write, the valid image group name should be normally under the logon user name.

SELECT CONTOUR CLOUD HEIGHT DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
HEIGHT	Cloud Height in Kilometers
COLORNUM	Color Number of Contour Color
DRAWOLD	Display existing contour

HEIGHT is the height of the cloud contour to be created. The cloud height determines the amount of shift to be made on the remapped image. The contour will then be created by connecting all the stationary points on the alternated stereo images.

COLORNUM is the color number defined in the GEMPLT package. Each color number corresponds to a graphics plane. The valid color numbers are from 1 to 6. The color number 4, which is the default, represents yellow in the normal GEMPLT setup.

DRAWOLD is a flag to display an old existing contour to the graphic plane. The default value is "NO".

The SELECT CONTOUR CLOUD HEIGHT DYNAMIC TUTOR selects the desired contour cloud height and graphic color number to draw on the stereo image pair and store into the contour file.

The following IIS button menu appears after the dynamic tutor is invoked:

	A	B	C	D	F
3	Define Contour Point	Close Contour	Zoom/ Unzoom Image	Reject Last Cont. Point	Exit
2	Increase Loop Speed	Decrease Loop Speed	Cursor on/off	Graphic plane on/off	Help
1	View Stereo Image	View Base/ Remapped Image	Contour From Other End	Move/shift Trackball	Accept

SRCREATE BUTTON MENU

1A: View Stereo Image

Views stereo image pair as a configuration in the IAT.

1B: View Base/Remapped Image

Views either base or remapped image member of stereo image pair.

1C: Contour From Other End

Draws the contour from the other end.

1D: Move/Shift Trackball

Toggles between move trackball and shift image modes.

1F: Accept

Accepts the drawn contour and stores it in contour file.

2A: Increase Loop Speed

Increases loop speed by 0.1 second increment.

2B: Decrease Loop Speed

Decreases loop speed by 0.1 second increment.

2C: Cursor On/Off

Toggles cursor on and off

2D: Graphic Plane On/Off

Toggles graphic plane on and off.

2F: Help

Displays IIS button help information.

3A: Define Contour Point

Defines current cursor position as a contour point.

3B: Close Contour

Closes contour loop.

3C: Zoom/Unzoom Image

Zooms and unzooms stereo image pair for more precise contour point selection.

3D: Reject Last Contour Point

Erases last contour point drawn.

3F: Exit

Exits the program.

The normal procedures to create a stereo cloud contour are:

- 1) Move cursor to a stationary point in the loop as the starting point.
- 2) Move cursor to next stationary point and push the Locate Next Point button. Repeat this step until end of the contour.
- 3) Use Zoom, Shift buttons to help locate the next point.
- 4) Push Close Contour button to close the contour loop.
- 5) Push accept to invoke the next IIS button menu
- 6) Push Select Smooth Contour button to perform 3rd-order polynomial fitting and produce a smoothed contour.

- 7) Push Accept button to store the resultant contour on the disk contour file.

After the contour is drawn the following IIS button menu appears to smooth and label the contour:

	A	B	C	D	F
3	Reject The Contour	Reject Last Label	Write Contour Label		Exit
2	Toggle Smoothed Contour	Toggle Unsmoothed Contour	Toggle Contour Label		Help
1	Select Smoothed Contour	Select Unsmoothed Contour			Accept

SMOOTH CONTOUR BUTTON MENU

1A: Select Smoothed Contour

Draws smoothed contour and selects it for storage.

1B: Select Unsmoothed Contour

Selects unsmoothed contour for storage.

1F: Accept

Accepts selected contour and label for storage in contour file.

2A: Toggle Smoothed Contour

Turns on/off the smoothed contour in graphics.

2B: Toggle Unsmoothed Contour

Turns on/off the unsmoothed contour in graphics.

2C: Toggled Contour Label

Turns on/off the contour label in graphics.

2F: Help

Lists help information on IIS buttons.

3A: Reject The Contour

Eliminates the current contour.

3B: Reject Last Label

Clears the label from the graphic plane.

3C: Write Contour Label:

Writes the contour label at the graphic box location.

3F: Exit

Exits the program.

PROGRAM SRDELETE

Delete Stereo Cloud Contours

FUNCTIONAL DESCRIPTION

SRDELETE deletes stereo cloud contours within a specific cloud height range. Deletion can only occur after the display of them on the graphics memory. A contour is drawn on a given graphics plane at a time and is deleted if requested.

PROGRAM DESCRIPTION

SRDELETE TUTOR

PARAMETER -----	DESCRIPTION -----	
INGROUP	Input Image Group	
STARTHGT	Starting Height of Contours	to be Deleted
ENDHGT	Ending Height of Contours	to be Deleted

INGROUP is the name of the image group where the base image and remapped image files are located. The current image group in the TAE global parameter F\$FILLOC is provided as the default. Because of file protection against write, the valid image group name should be under the logon user name.

STARTHGT is the starting height of stereo cloud contours to be possibly deleted. Contours of heights between STARTHGT and ENDHGT will be subsequently displayed on the graphics memory and each contour can be deleted if requested. The valid heights range from 0 to 20 km.

STARTHGT should be less than or equal to ENDHGT.

ENDHGT is the ending height of stereo cloud contours to be possibly deleted. Contours of heights between STARTHGT and ENDHGT will be subsequently displayed on the graphics memory and each contour can be deleted if requested. The valid heights range from 0 to 20 km.

ENDHGT should be greater than or equal to STARTHGT.

PROGRAM SREDIT

Edit Stereo Cloud Contour

FUNCTIONAL DESCRIPTION

SREDIT modifies an existing stereo cloud contour. The bad portion of the contour can be enclosed by a cursor box and that portion is deleted. A new contour segment is created to replace the deleted portion in the same manner as in the program SRCREATE.

PROGRAM DESCRIPTION

SREDIT TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input Image Group
HEIGHT	Height in KM of Contours to be edited

INGROUP is the name of the image group where the base image and remapped image files are located. The current image group in the TAE global parameter F\$FILLOC is provided as the default. Because of file protection against write, the valid image group name should be under the logon user name.

HEIGHT is the height of the cloud contours to be edited. If there is more than one contour, each contour will be displayed and then subject to editing.

Three IIS button menus appear after the top-level tutor is invoked as an aid in editing the contours. The normal procedures to edit an existing contour are:

- 1) After the contour to be edited appears on the screen, move box to enclose the bad portion using the Move ,Shape buttons and trackball. in the CONTOUR EDIT BUTTON MENU. Press accept to erase the bad contour segment.
- 2) Create a new contour segment. Use the button in the SREDIT CREATE CONTOUR BUTTON MENU as an aid in a similar fashion as done in program SRCREATE. Press accept button when new segment is complete.
- 3) Produce smoothed contour by pushing the Smooth Contour button in SMOOTH CONTOUR BUTTON MENU.

4) Push Accept button to store the edited contour.

	A	B	C	D	F
3	Draw Next Contour				Exit
2	Increase Loop Speed	Decrease Loop Speed	Box On/Off	Graphics On/Off	Help
1	View Stereo Image	View Base/ Remapped Image	Shape Box	Move Box	Accept

CONTOUR EDIT BUTTON MENU

1A: View Stereo Image

Views stereo image pair as a configuration in the IAT.

1B: View Base/Remapped Image

Toggles between base and remapped image members of stereo image pair.

1C: Shape Box

Sets trackball to shape box mode to select portion of contour to edit.

1D: Move Box

Sets trackball to move box mode to select portion of contour to edit.

1F: Accept

Erases portion of contour enclosed by box and drops the next button menu to allow replacement of erased contour segment.

2A: Increase Loop Speed

Increases loop speed between base and remapped image loop.

2B: Decrease Loop Speed

Decreases loop speed between base and remapped image loop.

2C: Box On/Off

Toggles the graphic box on and off.

2D: Graphics On/Off

Toggles the graphic planes on and off.

2F: Help

Displays button help information

3A: Draw Next Contour

Allows selection of another contour to edit.

3F: Exit

Exits program.

The following IIS button menu appears after the accept button is pressed in the CONTOUR EDIT BUTTON MENU.

	A	B	C	D	F
3	Define Contour Point	Close Contour	Zoom/ Unzoom Image	Reject Last Cont. Point	Exit
2	Increase Loop Speed	Decrease Loop Speed	Cursor on/off	Graphic plane on/off	Help
1	View Stereo Image	View Base/ Remapped Image		Move/shift	Accept

SREDIT CONTOUR CREATE BUTTON MENU

1A: View Stereo Image

Views stereo image pair as a configuration in the IAT.

1B: View Base/Remapped Image

Views either base or remapped image member of stereo image pair.

1D: Move/Shift Trackball

Toggles between move trackball and shift image modes.

1F: Accept

Accepts the drawn contour and stores it in contour file.

2A: Increase Loop Speed

Increases loop speed by 0.1 second increment.

2B: Decrease Loop Speed

Decreases loop speed by 0.1 second increment.

2C: Cursor On/Off

Toggles cursor on and off

2D: Graphic Plane On/Off

Toggles graphic plane on and off.

2F: Help

Displays IIS button help information.

3A: Define Contour Point

Defines current cursor position as a contour point.

3B: Close Contour

Closes contour loop.

3C: Zoom/Unzoom Image

Zooms and unzooms stereo image pair for more precise contour point selection.

3D: Reject Last Contour Point

Erases last contour point drawn.

3F: Exit

Exits the program.

After the contour is drawn the following IIS button menu appears to smooth and label the contour:

	A	B	C	D	F
3	Reject The Contour	Reject Last Label	Write Contour Label		Exit
2	Toggle Smoothed Contour	Toggle Unsmoothed Contour	Toggle Contour Label		Help
1	Select Smoothed Contour	Select Unsmoothed Contour			Accept

SMOOTH CONTOUR BUTTON MENU

1A: Select Smoothed Contour

Draws smoothed contour and selects it for storage.

1B: Select Unsmoothed Contour

Selects unsmoothed contour for storage.

1F: Accept

Accepts selected contour and label for storage in contour file.

2A: Toggle Smoothed Contour

Turns on/off the smoothed contour in graphics.

2B: Toggle Unsmoothed Contour

Turns on/off the unsmoothed contour in graphics.

2C: Toggled Contour Label

Turns on/off the contour label in graphics.

2F: Help

Lists help information on IIS buttons.

3A: Reject The Contour

Eliminates the current contour.

3B: Reject Last Label

Clears the label from the graphic plane.

3C: Write Contour Label:

Writes the contour label at the graphic box location.

3F: Exit

Exits the program.

PROGRAM SRESTHT

Estimate Stereo Cloud Heights

FUNCTIONAL DESCRIPTION

SRESTHT computes the heights of features selected from a specific stereo image pair. The height of a feature can be calculated from the shift amount of the remapped image using the stereo method. The results of computation are displayed on the CRT screen.

PROGRAM DESCRIPTION

SRESTHT TUTOR

PARAMETER -----	DESCRIPTION -----
IMGNAME	Name of the Stereo Configuration

IMGNAME is the stereo configuration name required to perform the cloud height computation by stereo shift method. If a configuration name is not specified, select one from the IAT image list.

The following IIS button menu appears after the top level tutor is invoked:

	A	B	C	D	F
3	Compute Height	View Stereo Image	View Base Image	View Remapped Image	Exit
2	Increase Loop Speed	Decrease Loop Speed	Cursor On/Off	Graphics On/Off	Help
1	Zoom/ Unzoom	Shift Image	Reset Shift	Move Cursor	Back

SRESTHT BUTTON MENU

1A: Zoom/Unzoom

Zooms stereo image pair to a maximum factor of eight and then resets to a factor of one.

1B: Shift Image

Shifts the remapped image to align a feature with the base image.

1C: Reset Shift

Resets the shift in the remapped image

1D: Move Cursor

Sets the cursor to move mode to select a feature.

1F: Back

Allows the selection of another stereo image pair.

2A: Increase Loop Speed

Increases the loop speed between the base and remapped images.

2B: Decrease Loop Speed

Decreases the loop speed between the base and remapped images.

2C: Cursor On/Off

Toggles the cursor on and off.

2D: Graphics On/Off

Toggles the graphic planes on and off.

2F: Help

Provides help information on the IIS buttons.

3A: Compute Height

Computes height of the selected feature.

3B: View Stereo Image

Views the stereo image pair configuration.

3C: View Base Image

Views the base image.

3D: View Remapped Image

Views the remapped image

3F: Exit

Exits the program.

The necessary steps to obtain stereo height estimates are:

- 1) Move cursor to locate a feature on the base image.
- 2) Shift remapped image to align that feature.
- 3) Loop the base image and the remapped image.
- 4) Continue to shift the remapped image until the feature appears stationary.
- 5) Press COMPUTE button to obtain height estimates.

PROGRAM SRLIST

List Cloud Contour Summary

FUNCTIONAL DESCRIPTION

SRLIST displays a summary list of the stereo cloud contours created for a specific stereo image pair.

PROGRAM DESCRIPTION

SRLIST TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP DEVICE	Input Image Group Output Device (Terminal, Printer)

INGROUP is the name of the image group where the base image and remapped image files are located. The current image group in the TAE global parameter F\$FILLLOC is provided as the default. Because of file protection against write, the valid image group name should be under the logon user name.

DEVICE is the output device name for listing of the contours. It can be "Terminal" for CRT terminal or "Printer" for line printer. Printed output is directed to the printer specified by the AOIPS/2 global printer device name variable F\$PRINT which can be changed by proc PRINTER.

PROGRAM SRLOOP

Loop Stereo Images

FUNCTIONAL DESCRIPTION

SRLOOP allows the selection of up to 12 stereo images for stereo image looping.

PROGRAM DESCRIPTION

SRLOOP TUTOR

PARAMETER -----	DESCRIPTION -----
IMGNames	Image Names for loop

IMGNames is an array of up to 12 names of IAT images for loop. If image names are not provided, they may be selected from the image list selection menu.

The following IIS button menu appears after the top level tutor is invoked:

	A	B	C	D	F
3	Forward Loop	Backward Loop	Bidirect. Loop	Redefine Loop	Exit
2	Turn On Cursor	Turn Off Cursor	Turn On Graphics	Turn Off Graphics	Help
1	Manual Loop	Auto Loop	Increase Loop Speed	Decrease Loop Speed	Help

SRLOOP BUTTON MENU

1A: Manual Loop

Steps through image sequence.

1B: Auto Loop

Loops through image sequence.

1C: Increase Loop Speed

Increases the loop speed by 0.1 second intervals.

1D: Decrease Loop Speed

Decreases the loop speed by 0.1 second intervals.

1F: Help

Lists IIS button help information.

2A: Turn On Cursor

Turns the cursor on.

2B: Turn Off Cursor

Turns the cursor off.

2C: Turn On Graphics

Turns the graphic planes on.

2D: Turn Off Graphics

Turns the graphic planes off.

2F: Help

Provides help information on the IIS buttons.

3A: Forward Loop

Sets the loop direction to be forward through the image sequence.

3B: Backward Loop

Sets the loop direction to be backward through the image sequence.

3C: Bidirect. Loop

Sets the loop direction to be bi-directional.

3D: Redfine Loop

Allow the image sequence to be re-defined.

3F: Exit

Exits the program.

PROGRAM SROVRLAY

Overlay Contours on Stereo Images

FUNCTIONAL DESCRIPTION

SROVRLAY draws selected stereo contours from the stereo contour file onto the IAT graphic planes superimposed on the appropriate stereo image pair.

PROGRAM DESCRIPTION

SROVRLAY TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input Image Group
STARHTGT	Starting Height of Contours to be overlaid
ENDHGT	Ending Height of Contours to be overlaid

INGROUP is the name of the image group where the base image and remapped image files are located. The current image group in the TAE global parameter F\$FILLOC is provided as the default. Because of file protection against write, the valid image group name should be under the logon user name.

STARHTGT is the starting height of stereo cloud contours to be displayed on graphics planes. Contours of heights between STARHTGT and ENDHGT will be subsequently overlaid on the specific stereo images. The valid heights range from 0 to 20 km.

ENDHGT is the ending height of stereo cloud contours to be displayed on graphics planes. Contours of heights between STARHTGT and ENDHGT will be subsequently overlaid on the specific stereo images. The valid heights range from 0 to 20 km.

The following IIS button menu is invoked after the top level tutor is executed:

	A	B	C	D	F
3	Turn On/Off Plane 1	Turn On/Off Plane 2	Turn On/Off Plane 3	Turn On/Off Plane 4	Exit
2	Turn On All Planes	Turn off All Planes	Turn On/Off Plane 5	Turn On/Off Plane 6	Help
1	View Stereo	View Base	View Remap	Turn On/Off Plane 7	

CONTOUR OVERLAY BUTTON MENU

1A: View Stereo

Views stereo image pair as a configuration.

1B: View Base

Views base image of stereo image pair.

1C: View Remap

Views remapped image of stereo image pair.

1D, 2C, 2D, 3A-3D: Turn/Off Plane (1-7)

Toggles specified graphic planes on and off.

2A: Turn On All Planes

Turns on all graphic planes.

2B: Turn Off All Planes

Turns off all graphic planes.

2F: Help

Displays IIS button help information.

3F: Exit

Exits the program.

PROGRAM SRREMAP

Remap Stereo Images

FUNCTIONAL DESCRIPTION

SRREMAP performs the geometric transformation to remap one satellite image (source image) to another satellite image (base image) coordinates for stereo analysis. Options exist to either remap a selectable image area or remap the entire image. The remapped image will be stored on the refresh memory with the proper image label. Two resampling methods are provided: the bilinear interpolation and the nearest neighbor. The former produces more accurate results but the latter takes less CPU time.

PROGRAM DESCRIPTION

SRREMAP TUTOR

PARAMETER -----	DESCRIPTION -----
SRCIMAGE	Source image (memory) number
BASIMAGE	Base image (memory) number
OUTIMAGE	Output image (memory) number
WINDOW	Remapping image Area
GRIDSIZ	Horizontal and vertical grid sizes
METHOD	Resampling method

SRCIMAGE is the memory number of the image to be remapped onto the base image. The default number 0, if accepted, will allow selection of source and base images from the image list.

BASEIMG is the memory number of the base image where the source image will be remapped onto. The default value 0, if accepted allows selection of source and base images from the image list.

OUTIMAGE is the memory number of the memory where the output image created by this program will be dropped. The default value 0, if accepted, allows selection of a memory from the image list.

WINDOW is the image area on the input image to be remapped, either the entire image or an image sector. If an image sector is preferred, select that area by positioning a graphics box on the base image. The valid values include: "ENTIRE IMAGE" and "IMAGE SECTOR"

GRIDSIZE is an array of two integers: horizontal grid size in unit of pixels and vertical grid size in unit of lines. The default size is 64x64 which corresponds 8X8 grids for a full size image. The valid range of each grid size is from 1 to 512.

METHOD is the technique used for interpolation of the source image. Two techniques are available:

- (1) bilinear interpolation
- (2) nearest neighbor

The following IIS button menu appears after the top level tutor is invoked:

	A	B	C	D	F
3	Compute Height	View Stereo Image	View Base Image	View Remapped Image	Exit
2	Increase Loop Speed	Decrease Loop Speed	Cursor On/Off	Blank Output	Help
1	Reset Shift	Shift Remapped Image	Reset Cursor	Move Curosr	Back

SRREMAP BUTTON MENU

1A: Reset Shift

Resets the shift factors in the remapped image.

1B: Shift Remapped Image

Sets the cursor control to shift the remapped image.

1C: Reset Cursor

Moves the cursor back to the center of the screen.

1D: Move Cursor

Sets the cursor control to move the cursor.

1E: Back

Allows another attempt at remapping the source image.

2A: Increase Loop Speed

Increases the loop speed between the remapped and base image for comparison purposes.

2B: Decrease Loop Speed

Decreases the loop speed between the remapped and base image for comparison purposes.

This IIS button interface facilitates the calibration of the stereo image pair. To calibrate the stereo image pair:

1. Select a cloud or landmark of known height.
2. Shift the remapped image to match the base image for this feature using the various IIS buttons as an aid.
3. Press the Compute Height button and enter the known height of the landmark.

PROGRAM SRSYNTH

Create Synthetic Stereo Image

FUNCTIONAL DESCRIPTION

SRSYNTH produces a synthetic stereo pair from an image pair. Usually a visible (base) and IR (source) image are used to generate a three dimensional cloud scene. However, in principle any two images can be used where the source image contains height information. The parallax is created by translating the source grey values to image offsets in the base image. A shifted base image is generated and logically linked to the base image to produce the synthetic stereo pair which is viewed as a configuration in the IAT. The base image is viewed through the red gun and the shifted base image is viewed through the green and blue guns. The three dimensional effect is seen using special glasses.

PROGRAM DESCRIPTION

SRSYNTH TUTOR

PARAMETER -----	DESCRIPTION -----
VISIMAGE	Visible image (memory) number
IRIMAGE	IR image (memory) number
OUTIMAGE	Output image (memory) number
IRRANGE	IR Grey Value Range
HORSHIFT	Range of Pixel Shifts
VERSHIFT	Range of Line Shifts

VISIMAGE is the memory number of the visible image that will become the base (red) image of the output synthetic stereo pair.

IRIMAGE is the memory number of the IR image (source image) that is associated with the visible image. The grey counts of the IR image data will be converted to horizontal and vertical shifts for creation of the synthetic stereo image.

OUTIMAGE is the memory number of the output image that will be coupled with the visible (base) image as the synthetic stereo image.

IRRANGE is the minimum and maximum grey values of IR (source) data used for shift calculation.

HORSHIFT is minimum and maximum horizontal image shifts allowed when calculated from the source image (IR) data.

VERSHIFT is the minimum and maximum vertical image shifts allowed when calculated from the source image (IR) data.

PROGRAM SRTRAN

Transform Contours to Remapped Image

FUNCTIONAL DESCRIPTION

SRTRAN transforms the stereo derived contours from the stereo image pair to the remapped image component of that pair.

PROGRAM DESCRIPTION

SRTRAN TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input Image Group
HEIGHT	Cloud Height in Kilometers
COLORNUM	Color numbers for contour pair

INGROUP is the name of the image group where the base image and remapped image files are located. The current image group in the TAE global parameter F\$FILLOC is provided as the default. Because of file protection against write, the valid image group name should be under the logon user name.

HEIGHT is the height of the cloud contour to be transformed. The cloud height determines the amount of shift to be made on the remapped image.

COLORNUM specifies the color numbers for the untransformed and the transformed contours. The default color number pair is (2,6) which corresponds to (red,blue).

The following IIS button menu is invoked after the top level tutor is executed:

	A	B	C	D	F
3	Turn On/Off Plane 1	Turn On/Off Plane 2	Turn On/Off Plane 3	Turn On/Off Plane 4	Exit
2	Turn On All Planes	Turn off All Planes	Turn On/Off Plane 5	Turn On/Off Plane 6	Help
1	View Stereo	View Base	View Remap	Turn On/Off Plane 7	

CONTOUR OVERLAY BUTTON MENU

1A: View Stereo

Views stereo image pair as a configuration.

1B: View Base

Views base image of stereo image pair.

1C: View Remap

Views remapped image of stereo image pair.

1D, 2C, 2D, 3A-3D: Turn/Off Plane (1-7)

Toggles specified graphic planes on and off.

2A: Turn On All Planes

Turns on all graphic planes.

2B: Turn Off All Planes

Turns off all graphic planes.

2F: Help

Displays IIS button help information.

3F: Exit

Exits the program.

PROGRAM TKCONVER

Convert Cloud File to GEMPAK Format

FUNCTIONAL DESCRIPTION

A cloud file must be converted to a GEMPAK-format file before it can be used in the GEMPAK applications. To convert the cloud file, the variables, PARMS, to be transferred to the GEMPAK file must be specified. The pressure levels to assign to these variables must also be specified. Pressure level assignment is based on the cloud height, computed from IR data or measured by the stereo method, where the specified height levels (in kilometers) define the separation into pressure levels.

The name of the GEMPAK file will always be:

GEMIRxxx.TRK if HGTTYPE="IR",
GEMSRxxx.TRK if HGTTYPE="STEREO",

where SETxxx.TRK is the corresponding cloud file name and xxx is the cloud image set number, TKSETNUM. The converted file is in the form of a GEMPAK upper-air file.

PROGRAM DESCRIPTION

TKCONVER TUTOR

PARAMETER	DESCRIPTION
-----	-----
TKSETNUM	Cloud Tracking Set Number
PRES	Pressure levels including ground
HEIGHT	Height Levels excluding ground
PARMS	Cloud File Parameters to be Transferred
HGTTYPE	Cloud Height Source, either IR (default) or STEREO

TKSETNUM is the cloud image set number which corresponds to the cloud file SETxxx.TRK, if TKSETNUM = xxx. The default set number is the one stored as the TAE global parameter, TK\$FILE.

PRES are pressure levels to be assigned to cloud winds in the GEMPAK file. It should be a list of pressures (in millibars) starting from the pressure level nearest

to the ground (for example, 1000,800,...,200). The maximum number of pressure levels in the list is 10.

HEIGHT are height levels corresponding to the pressure levels specified in TAE parameter PRES. It is a list of up to 9 height values in units of kilometers. The first height level is at the bottom of the second pressure level, and so on. The bottom of the first pressure level is always at the ground, zero height. The number of heights in the HEIGHT list should be one less than the number of pressures in PRES.

PARMS are parameters in the cloud file to be transferred to the GEMPAK-format file. Following are parameters available in the cloud file:

PRES	cloud top pressure computed from IR data
UWND	U-component (east/west) of the wind velocity
VWND	V-component (north/south) of the wind velocity

HGTTYPE specifies the type of measured cloud height to be stored in the cloud file. The choices are:

IR	cloud height computed from the associated IR data
STEREO	cloud height measured by the stereo method

Specify either one, but not both.

PROGRAM TKCORREC

Correct Wind Speed

FUNCTIONAL DESCRIPTION

TKCORREC will re-compute the earth coordinates of each cloud with cloud height information. The earth coordinates of the cloud created by the measurement functions are computed assuming the cloud is at ground level (height = 0). A parallax correction will be made for the location of cloud vectors with non-zero cloud height. The wind speed and direction are also re-computed using the corrected coordinates of the cloud on each image in the sequence of images.

This procedure should only be run ONCE for a cloud file!
The effect of the parallax correction is cumulative!

PROGRAM DESCRIPTION

TKCORREC TUTOR

PARAMETER -----	DESCRIPTION -----
TKINGSET	Cloud tracking image set number
PRIMARY	Primary cloud height to be used for correction
ALTERNAT	Alternate cloud height to be used if primary height not available
STARTCLD	Starting cloud number
ENDCLD	Ending cloud number

TKINGSET is the cloud set number or file number of the cloud tracking data file on which the wind speed correction will be performed. The default set number is the current cloud tracking set number. Enter 0 to select from the list of cloud tracking sets in the catalog.

PRIMARY is the primary cloud height value to be used in the cloud location and wind speed correction. The value may be either the height computed from IR data or the value measured by the stereo method.

-- Valid values are IR, STEREO.

ALTERNAT is the secondary cloud height type to be used in the computation when the primary cloud height is not available. If only the primary cloud height data are to be

used, enter the value "NONE", and a cloud height of zero will be used for wind velocity computation when the primary height is missing.

-- The valid values to enter are IR, STEREO, NONE.

STARTCLD is the starting cloud number of a set of sequential cloud vectors (records) to recompute with the cloud height information. All cloud vectors between STARTCLD and ENDCLD will be recomputed.

-- This value is not required if TKINGSET = 0.

ENDCLD is the cloud number of the last cloud vector to recompute with the cloud height information. If ENDCLD is greater than the number of cloud vectors in the file, processing will stop at the end of the file.

PROGRAM TKDELETE

Delete Cloud Vectors

FUNCTIONAL DESCRIPTION

TKDELETE deletes either a cloud file or cloud vectors (records) within a specified range. The cloud records will not be physically deleted from the cloud file. Instead, they are flagged and the contents remain intact. Flagged winds will not be used in cloud vector overlay and measurement programs unless undeleted by TKREC, "Recover Cloud Vectors". In contrast, cloud files are physically deleted from the disk, directory, and catalog when the data category to be deleted is a file instead of a record.

DELETED CLOUD FILES CANNOT BE RECOVERED!!!

PROGRAM DESCRIPTION

TKDELETE TUTOR

PARAMETER -----	DESCRIPTION -----
TKIMGSET	Cloud tracking image set number to be processed
CATEGORY	Data category to be deleted
DROPIMG	Drop image flag
SELECT	Select cloud method
GRFTYPE	Graphics type of cloud vectors
STARTCLD	Starting cloud number
ENDCLD	Ending cloud number

TKIMGSET is the cloud tracking image set to be processed. The default is the current cloud image set. If you enter the value 0, the list of cloud sets will be displayed and one set number can be selected.

-- The cloud range given by STARTCLD and ENDCLD do not need to be specified before running the proc if 0 is entered for the cloud tracking set number.

CATEGORY is the data structure type to be deleted. If CATEGORY = 'FILE', the entire cloud file will be physically deleted. If CATEGORY = 'RECORD', only the cloud vectors specified by cloud number range will be flagged for deletion in automatic mode.

!Caution!

Deleted cloud files cannot be recovered!

DROPIMG allows the cloud set images to be displayed on

the refresh memories. If the images already displayed on the IAT device, they don't need to be re-dropped. Take the default value 'NO'.

SELECT specifies the mode used to select clouds for deletion. Two different modes are provided for cloud vector deletion, 'NUMBER' and 'CURSOR'. In number mode, the cloud number range must be correctly specified. A completion message indicates that cloud vectors are successfully flagged for deletion. In cursor mode, you will be asked to locate the clouds displayed on the graphics plane using the cursor. The nearest cloud to the cursor will be found in the cloud file and then flagged for deletion.

GRFTYPE selects one of two graphics types for cloud vectors: 'BARB' or 'ARROW'. This parameter must be specified when running the proc in interactive mode.

STARTCLD is the starting cloud number of consecutive cloud vectors to be deleted. A valid value must be entered when running in automatic mode (SELECT=NUMBER).

ENDCLD is the ending cloud numbers of consecutive cloud vectors to be deleted. A valid value must be entered in automatic mode (SELECT=NUMBER).

If a value of zero is entered for the parameter **TKIMGSET**, the list of cloud tracking image sets in the current directory will be displayed and the user will be permitted to select a value from the list. The user can select the image set by either entering the reference number of the set from the list column labeled "REF NO.", or entering the set number from the "IMAG SET#" column of the list in the format of S or s followed by the 3-digit number (S234, for example). An asterisk (*) next to the reference number in the listing immediately indicates the currently selected image set.

-- Detailed information about an image set is available by entering **HELP #**, where # is the reference number of the image set.

-- Once the image set has been selected, **EXIT** to begin deletion.

- 1) If **CATEGORY** = 'FILE', the user will be asked to enter a 'YES' or 'NO' to confirm the file deletion request. If the response is YES, the file will be deleted. If the response is NO, the file will be retained.
- 2) If **CATEGORY** = 'RECORD', **SELECT** = 'NUMBER', and both **STARTCLD** and **ENDCLD** = '0', a listing of cloud

information by number will be produced. PAGE ahead to HELP titled DELETE BY LISTING for cloud deletion instructions.

- 3) If CATEGORY = 'RECORD', SELECT = 'NUMBER', and STARTCLD and ENDCLD are specified, those cloud numbers between STARTCLD and ENDCLD will be automatically flagged as deleted.
- 4) If CATEGORY = 'RECORD' and SELECT = 'CURSOR', the cloud vectors/heights will be plotted on the graphics planes and an IIS button menu will drawn. PAGE ahead to DELETE BY CURSOR for cloud deletion instructions.

DELETE BY NUMBER

When deleting images from the list, a listing by cloud number of measured cloud parameters is displayed on the terminal. Parameters include: (1) cloud number, (2) image pair for the cloud vectors, (3) speed and (4) direction of cloud motion between the image pair, (5) latitude and (6) longitude of the cloud, (7) IR height, (8) pressure height in millibars, (9) stereo height and (10) stereo height error.

- To delete a cloud, enter the number of the cloud followed by a return. An asterisk (*) will appear to the left of the cloud number on the listing to indicate that the cloud has been flagged as deleted.
- Complete detailed information for a cloud can be displayed by entering HELP #, where # is the cloud number in the listing. All information for the cloud for each image and image pair will be displayed.

DELETE BY CURSOR

When deleting clouds by cursor selection, the following button menu will be drawn for the IIS buttons:

	A	B	C	D	F
3	Turn On/Off Plane 1	Turn On/Off Plane 2	Turn On/Off Plane 3	Turn On/Off Plane 4	Exit
2	Turn On/Off Plane 5	Turn On/Off Plane 6	Turn On/Off Plane 7	Redraw Graphics	Define
1	Turn On All Planes	Turn Off All Planes	Delete Cloud	Undelete Cloud	Help

DELETE CLOUD BY CURSOR BUTTON MENU

Deletion of clouds from the cloud set is accomplished by moving the cursor near to the cloud to be deleted and pressing IIS button C1 ("Delete Cloud"). The number of the deleted cloud will appear on the terminal. In case of a mistake, pressing button D1 ("Undelete Cloud") will recover the cloud nearest the cursor. After the desired clouds have been deleted, button D2 ("Redraw Graphics") will clear the old graphics and redraw the graphics only for the undeleted clouds.

- Button F1 ("Help") will print the functional descriptions of each IIS trackball/button on the user's terminal.
- Button F3 ("Exit") terminates the program and returns to the command prompt or the MENU.

PROGRAM TKEDIT

Edit Cloud File Label

FUNCTIONAL DESCRIPTION

TKEDIT provides the capability to modify some of the information in the cloud file header.

PROGRAM DESCRIPTION

TKEDIT TUTOR

PARAMETER -----	DESCRIPTION -----
TKIMGSET	Cloud tracking image set number

TKIMGSET is the set number or file number of the cloud tracking data file to be edited, SETnnn.TRK, where TKIMGSET = nnn. The default value is the current image set number.

-- Enter 0 to select a cloud set from the catalog list.

If a value of zero is entered for the parameter TKIMGSET, the list of cloud tracking image sets in the current directory will be displayed and the user will be permitted to select a value from the list. The user can select the image set by either entering the reference number of the set from the list column labeled "REF NO.", or entering the set number from the "IMAG SET#" column of the list in the format of S or s followed by the 3-digit number (S234, for example). An asterisk (*) next to the reference number in the listing immediately indicates the currently selected image set.

-- Once the image set has been selected, EXIT to begin editing.

-- Detailed information about an image set is available by entering HELP #, where # is the reference number of the image set.

After TKEDIT is initiated with a valid cloud image set number, a standard TAE tutor listing the current label parameters is displayed. Parameters marked with a '*' may not be edited.

Only the base image file numbers, the remapped image file numbers, the wind arrow scale factor, and the short cloud set name may be edited.

EDIT CLOUD SET LABEL DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
NIMAGE	Number of images in the set (*)
BASEIMG	Base image file number
REMAPIMG	Remapped image file number
NTRACK	Number of cloud tracked
NPROCESS	Number of cloud processed
SCALEFAC	Scale factor
TKSETNAM	Cloud set name
TIMESEQ	Cloud set type (*)
IMGTYPE	Cloud set image type (*)

NIMAGE is the number of images in the cloud tracking set. Up to 4 images are allowed in a set. If the set is for cloud tracking, there should be at least 2 images. This value is not editable.

BASEIMG is the base image file numbers in the set.

REMAPIMG is the remapped image file numbers corresponding to the base images if it is a stereo image set.

NTRACK is the number of clouds tracked.

NPROCESS is the number of clouds processed.

SCALEFAC is the wind arrow scaling factor.

TKSETNAM is the cloud set name.

TIMESEQ is the cloud set type. It is for reference only !! For cloud tracking, it must be a time-sequenced cloud set. For measuring the cloud height only, it can be either a time-sequenced cloud set or a non-related cloud set.

IMGTYPE is the image type in the set. It is for reference only !!! **IMGTYPE** can be either 'BW' or 'STEREO'. For cloud tracking only, the images can be either type. If stereo cloud height measurements are required, then it must be the STEREO.

The EDIT CLOUD SET LABEL dynamic tutor provides the

capability to edit the value of scale factor, cloud set name, base image file numbers, number of cloud tracked and number of cloud processed.

A "*" after the description means the item is not editable.

PROGRAM TKEDITHT

Measure Cloud Height

FUNCTIONAL DESCRIPTION

This program is to add or edit the stereo cloud height to specific clouds. The clouds will be selected from the cloud file list, one at a time. After a cloud is selected, the cursor will move to the cloud position and you can choose either stereo shift method or cross correlation method to measure cloud height.

PROGRAM DESCRIPTION

TKEDITHT TUTOR

PARAMETER -----	DESCRIPTION -----
TKIMGSET	Cloud tracking image set number
DROPIMG	Drop image set flag
COPYHGT	Flag to copy cloud height

TKIMGSET is the cloud tracking image set number or the cloud file number for the image set to be processed. The default image set number is the 'current image set' number stored as a TAE global parameter. The 'current image set' will not change if a different number is assigned to this parameter.

DROPIMG is a flag to drop the cloud tracking image set on the refresh memories. If the image set was previously dropped and is currently displayed on the IAT, it is not necessary to drop the images again. The default value of this parameter is 'NO'.

COPYHGT is a parameter used to determine whether the cloud height computed from image 1 should be copied into the cloud height variable locations of the other images in the cloud file. The default value is "YES". If "NO", then the cloud height on other images in the set will be zero until the cloud height is measured separately for those images.

PROGRAM TKFILNAM

Obtain Cloud and GEMPAK File Names

FUNCTIONAL DESCRIPTION

The cloud file name and the associated GEMPAK file name can be obtained from the cloud tracking image set number and the current image group name. If the cloud image set number is **xxx** and the image group name is **DISK:[USER.AOIPS.GROUP]**, then the cloud file name is:

DISK:[USER.AOIPS.GROUP]SETxxx.TRK

and the corresponding GEMPAK file name is:

DISK:[USER:AOIPS.GROUP]GEMIRxxx.TRK
or **DISK:[USER:AOIPS.GROUP]GEMSRxxx.TRK**

if HGTTYPE is IR or STEREO respectively.

PROGRAM DESCRIPTION

TKFILNAM TUTOR

PARAMETER -----	DESCRIPTION -----
TKSETNO	Cloud Tracking Image Set Number
HTYPE	Cloud Height Source or Type
TKFNAME	Cloud Tracking Data File Name
SNFNAME	GEMPAK Format Cloud File

TKSETNO is the set number or file number of the cloud tracking files to be named, where **TKSETNO** = nnn. The default value is the current image set number. Enter 0 to select a cloud set from the catalog list.

Cloud Height Source or Type

Cloud Tracking Data File Name

GEMPAK Format Cloud File

PROGRAM TKHGT

Measure Cloud Height

FUNCTIONAL DESCRIPTION

TKHGT computes the height of clouds interactively selected by the user. The cloud height can be estimated from IR imagery or by the stereo technique.

PROGRAM DESCRIPTION

TKHGT TUTOR

PARAMETER -----	DESCRIPTION -----
TKIMGSET	Cloud tracking image set number
STARTCLD	Starting cloud number to process 0 - start with new cloud at end of file
DROPIMG	Drop cloud image set
METHOD	Cloud height computation method
COPYHGT	Copy cloud height
IRMODE	IR height determination mode
CLDTYPE	Cloud Type - water or ice
SAMPSIZE	Cloud sample box size

TKIMGSET is the cloud tracking image set number or the cloud file number of the images set to be processed. The default image set number is the 'current image set' number stored as a TAE global parameter. The 'current image set' will not be changed if you assign a different number to this parameter.

STARTCLD specifies the starting cloud number to process in the cloud file. If zero is specified, the program will create and process a new cloud at the end of the file.

DROPIMG determines whether the cloud tracking image set will be dropped to refresh memories. If the image set was previously dropped and is currently displayed on the IAT, it does not need to be dropped again. The default value of this parameter is 'NO'.

METHOD determines the method to be used for the measurement of cloud height. The value of METHOD can be 'IR' or 'STEREO', corresponding to the IR method or the stereo method, respectively. The default value is 'STEREO'.

COPYHGT determines whether the cloud height computed from image 1 is to be copied to the cloud height slots for the other images in the cloud file. The default value is "YES".

IRMODE is required for cloud top height determination by the IR method (METHOD="IR"). Two modes are provided:

Mode 1: Cloud height is computed from the grey values from both visible and IR images.
Parameter value = "VI-IR"

Mode 2: Cloud height is computed from the grey value from the IR image only.
Parameter value = "IR"

The default value is "IR"

CLDTYPE is required when cloud top height is to be determined by the IR method (METHOD="IR"). There are two cloud types: water cloud or ice cloud. The corresponding parameter values are "WATER" and "ICE". The default value is "WATER".

SAMPsize is a value required for cloud top height determination using the IR method (METHOD="IR"). A square box centered at the cloud (cursor) will be used to collect visible and IR grey values for the cloud height computation. The default sample box size is 7 (7x7 screen pixels). The valid range of the box size is from 3 to 15.

After the proper parameters have been entered and TKHGT is run, the messages:

"Processing cloud no. (number)"

"Locate cloud on image no. 1"

will appear on the user terminal, and the following button menu will be drawn on the IIS display:

	A	B	C	D	F
3	Locate Cloud		Compute Height		Exit
2	Fast Loop	Slow Loop	Cursor On/Off	Graphics On/Off	Help
1	View Image 1	View Image 2	View Image 2	View Image 4	Accept

IR HEIGHT MEASUREMENT BUTTON MENU

Cloud height computation now proceeds in one of two ways, depending on the value entered for the parameter STARTCLD in the initial TKHGT Tutor.

If the cloud has already been tracked in TKMOVE and STARTCLD is a valid non-zero value, the cursor will automatically move to the cloud marker position on Image 1 for the cloud whose number corresponds to STARTCLD. To compute the height of a cloud using the IR method, the user simply presses the button labeled "Compute Height", and the height computation results for Image 1 will be displayed on the terminal. If the value of the parameter COPYHGT in the Tutor is "NO", then Image 2 of the sequence will be displayed and the cursor will automatically move to the measured position of the cloud on that image. The user again presses "Compute Height" to calculate the cloud height for Image 2. This process is repeated until the height has been measured on all the images in the set. If COPYHGT = "YES", the height need only be measured for one image in the sequence, and this height will be copied to the other images in the sequence.

If the value of STARTCLD = "0", height measurement will begin with a new cloud number at the end of the file. In this case, the user must define the location of the cloud on the images by positioning the cursor on the cloud. To select a cloud on an image, display the image by pressing one of the buttons "View Image n", where n is the number of the base image in the set. Move the Cursor to the cloud and press "Locate Cloud" to define the cloud position. This process must be repeated for each image in the cloud set. Next, press "Compute Height" to calculate the height of the cloud on the displayed image. If the COPYHGT parameter is "YES", only one height needs to be computed; otherwise, a height must be computed for each image in the sequence. Once the cloud locations have been defined on each image using "Locate Cloud", the cursor will follow the cloud location on the displayed image, and the "Compute

Height" button will use the cursor location on the currently displayed image.

- Once the heights have been computed, the user must either "Accept" the computed values and proceed to the next cloud, or "Exit" to change the Tutor parameters or start with a different cloud. If COPYHGT = "YES", the last height that is computed for the current cloud number will be copied to all images in the set.

PROGRAM TKLIST

List Cloud Vectors

FUNCTIONAL DESCRIPTION

TKLIST lists cloud vectors and heights on the terminal or the line printer.

PROGRAM DESCRIPTION

TKLIST TUTOR

PARAMETER -----	DESCRIPTION -----
TKIMGSET	Image set number
DEVICE	Output device (Terminal,Printer)
STARTCLD	Start cloud number
ENDCLD	End cloud number

TKIMGSET is the image set number of the cloud file to be listed. The valid values are from 0 to 999. Entering 0 allows the contents of the file to be examined. The user can then select the clouds to be printed out.

DEVICE specifies the output device. Valid values are:

"PRINTER" for the line printer
"TERMINAL" for the CRT terminal.

Output goes to the printer specified by the AOIPS/2 global printer device specified by variable F\$PRINT. F\$PRINT can be changed by running the proc PRINTER.

STARTCLD is the starting cloud number of cloud vectors to be listed. Valid values are from 1 - 999.

ENDCLD is the ending cloud number of cloud vectors to be listed. Valid values are from 1 - 999. ENDCLD cannot be less than STARTCLD.

If a value of zero is entered for the parameter TKIMGSET, the list of cloud tracking image sets in the current directory will be displayed and the user will be permitted to select a value from the list. The user can select the image set by either entering the reference number of the

set from the list column labeled "REF NO.", or entering the set number from the "IMAG SET#" column of the list in the format of S or s followed by the 3-digit number (S234, for example). An asterisk (*) next to the reference number in the listing immediately indicates the currently selected image set.

- Once the image set has been selected, EXIT to begin listing.
- Detailed information about an image set is available by entering HELP #, where # is the reference number of the image set.

After TKLIST is initiated with a valid cloud image set number, a listing by cloud number of measured cloud parameters is produced. Parameters include: (1) cloud number, (2) image pair for the cloud vectors, (3) speed and (4) direction of cloud motion between the image pair, (5) latitude and (6) longitude of the cloud, (7) IR height, (8) pressure height in mbs, (9) stereo height and (10) stereo height error.

- Complete detailed information for a cloud can be displayed by entering HELP #, where # is the cloud number in the listing. All information for the cloud for each image and image pair will be displayed.

PROGRAM TKMOVE

Measure Cloud Motion

FUNCTIONAL DESCRIPTION

TKMOVE is used to measure cloud movement and estimate the wind velocity using navigation information of the cloud images. Three methods are provided:

- 1) single point tracking;
- 2) cross correlation matching;
- 3) null motion by shifting images.

The cloud locations and velocities will be stored in the cloud tracking data file when accepted. TKMOVE requires very accurate image alignment and navigation.

A valid image set number must be entered for the parameter TKIMGSET. Entering zero for TKIMGSET will NOT allow the user to select from the image set list, but instead will result in an error message. If the default value for TKIMGSET is not used, the value entered will be used in TKOVLAY, but will not change the default value for TKIMGSET in other programs.

Either a value of zero or a valid value for STARTCLD must be entered in the Tutor mode. A value of zero will continue with a new cloud number at the end of the file. A non-zero value will reprocess the wind vectors from STARTCLD to the end of the file.

PROGRAM DESCRIPTION

TKMOVE TUTOR

PARAMETER -----	DESCRIPTION -----
TKIMGSET	Cloud tracking image set number
STARTCLD	Starting cloud number to process 0 = start with new cloud at end of file
DROPIMG	Drop cloud image set
GRFTYPE	Graphics type of cloud vector

TKIMGSET is the cloud tracking image set number or the cloud file number of the cloud image set to be processed. The default image set number is the 'current image set' number stored as a TAE global parameter. The default value for 'current image set' will not change if a different number is assigned to this parameter in this tutor.

STARTCLD specifies the starting cloud number to process in the file. If STARTCLD is set to zero, then TKMOVE will process a new cloud and add it at the end of the dataset.

DROPIMG is a flag to drop the cloud tracking image set on refresh memories. If the image set was previously dropped and is currently displayed on the IAT, the images do not need to be dropped again. The default value of this parameter is 'NO'.

GRFTYPE is the type of graphic symbol used to display cloud vectors. It can be either an arrow or a wind barb. The default is "BARB".

After the proper parameters have been entered and TKMOVE is run, the messages:

"Processing cloud no. (number)"

"Press button to select cloud motion measurement method"

will appear on the user terminal, and the following button menu will be drawn on the IIS display:

	A	B	C	D	F
3	Cross Correlation Method	Single Point Method	Null Motion Method		Exit
2					Help
1					

CLOUD TRACKING METHOD BUTTON MENU

At this point, the user must select one of the three cloud motion measurement methods for the cloud tracking process.

-- Button A3 will select the "Cross Correlation Method" of cloud tracking.

This method uses a pattern recognition technique to automatically determine the position of the chosen cloud on each image in the set. Choose this method only when the cloud pattern is well-structured and slowly changing.

-- Button B3 will select the "Single Point Method" of cloud tracking.

This is a manual cloud tracking method where the user defines the position of the cloud on each image in the set by positioning the cursor on the cloud. Select this method when the cloud feature being traced can be identified with confidence on each image in the sequence.

-- Button C3 will select the "Null Motion Method" of cloud tracking.

In this method, the user "shifts" each image in the sequence so that the cloud feature remains stationary when the images are looped on the display. This method is generally the most accurate cloud tracking method, and is particularly well-suited for use with rapidly-changing clouds or cloud fields.

-- Button F3 ("Exit") terminates the program and returns to the command prompt or the MENU.

-- Button F2 ("Help") will print the functional descriptions of each IIS trackball/button on the user's terminal.

If the "Cross Correlation Method" of cloud tracking is

selected from the IIS button menu, the following IIS button menu will be drawn for the actual cloud tracking process.

	A	B	C	D	F
3	Locate Cloud	Compute Wind	Compute Wind	Switch Method	Exit
2	Fast Loop	Slow Loop	Box On/Off	Graphics On/Off	Help
1	View Base Image 1	View Base Image 2	View Base Image 3	View Base Image 4	Accept

CROSS-CORRELATION TRACKING BUTTON MENU

Cloud tracking in the Cross Correlation Method is accomplished generally as follows. Start a loop of the images in the set by pressing either the button "Fast Loop" or "Slow Loop". Choose the cloud to be tracked and press "View Base Image 1" to stop the loop at the first image in the sequence. Move the center of the cursor over the cloud and press "Locate Cloud". The message

"Cloud located on image no. 1"

will appear on the terminal, and the IIS display will automatically step to the next image in the sequence. This message will appear each time the "Locate Cloud" button is pushed. Move the cursor/box approximately over the cloud on image 2 and press "Locate Cloud" again. Repeat this set of commands for each image in the sequence.

When the cloud has been located on each image in the sequence, start the image loop and note that the cursor follows the cloud locations that have been defined. Make any changes or corrections to the cloud/cursor locations by pressing "View Base Image" for the image to be corrected, move the cursor to the corrected position, and press "Locate Cloud" again. When satisfied with the locations, press "Compute Wind" to view the computed results.

In all cloud tracking methods, a standard terminal display will be used to present the results when "Compute Wind" is performed. There may be up to 4 image pairs (Column 1) in the display, depending on the number of images in the cloud wind set. MEANS and S.D. are the mean and standard deviation of the wind variables for all the image pairs.

The computed results in the Cross Correlation method will include information about the structure of the cloud patterns within the defined box areas and the calculated winds from the pattern correlations. A high value of the peak to background ratio (close to 1.0) indicates sufficient cloud structure for good pattern correlations. The user must still decide from the calculated winds displayed on the terminal whether to accept or reject the results.

- If the calculated wind is acceptable, press "Accept" and the wind barb or arrow will be drawn on the graphics plane. A new cloud number will be defined for the next cloud. Another cloud may now be tracked by repeating the steps to locate its position on each image in the sequence.
- If the calculated wind is not acceptable, the user can (1) relocate the same cloud on the images making any cursor corrections, (2) locate a different cloud on the images and compute a new cloud wind, (3) switch to a different cloud tracking method by pressing the "Switch Method" button, or (4) exit from the program by pressing the "Exit" button. The cloud number will remain the same unless the "Accept" button is pushed.
- The "Accept" button will not be active until a cloud has been tracked and a wind has been calculated by pressing "Compute Wind".
- The computed wind is immediately written into the cloud wind file when the "Accept" button is pushed. If the wind is found to be in error, the wind vector may be deleted by running TKDEL and marking the bad wind vector for deletion. The same cloud may be tracked more than once whether or not the overlapping vectors have been deleted, although this situation is not recommended.

If the "Single Point Method" of cloud tracking is selected from the IIS button menu, the following IIS button menu will be drawn for the actual cloud tracking process.

	A	B	C	D	F
3	Locate Cloud	Zoom/ Unzoom	Compute Wind	Switch Method	Exit
2	Fast Loop	Slow Loop	Cursor On/Off	Graphics On/Off	Help
1	View Base Image 1	View Base Image 2	View Base Image 3	View Base Image 4	Accept

SINGLE-POINT TRACKING BUTTON MENU

Cloud tracking in the Single Point Method is accomplished generally as follows. Start a loop of the images in the set by pressing either the button "Fast Loop" or "Slow Loop". Choose the cloud to be tracked and press "View Base Image 1" to stop the loop at the first image in the sequence. Move the center of the cursor over the cloud and press "Locate Cloud". The message

"Cloud located on image no. 1"

will appear on the terminal, and the IIS display will automatically step to the next image in the sequence. Move the cursor/box exactly over the cloud feature on image 2 and press "Locate Cloud" again. Repeat this set of commands for each image in the sequence.

When the cloud has been located on each image in the sequence, start the image loop and note that the cursor follows the cloud locations that have been defined. Make any changes or corrections to the cloud/cursor locations by pressing "View Base Image" for the image to be corrected, move the cursor to the corrected position, and press "Locate Cloud" again. When satisfied with the locations, press "Compute Wind" to view the computed results.

The computed results in the Single Point method will include information about calculated winds from the cursor locations on the images. The user must decide from the calculated winds displayed on the terminal whether to accept or reject the results.

-- If the calculated wind is acceptable, press "Accept" and the wind barb or arrow will be drawn on the graphics plane. A new cloud number will be defined for the next cloud. Another cloud may now be tracked by repeating the steps to locate its position on each image in the sequence.

- If the calculated wind is not acceptable, the user can (1) relocate the same cloud on the images making any cursor corrections, (2) locate a different cloud on the images and compute a new cloud wind, (3) switch to a different cloud tracking method by pressing the "Switch Method" button, or (4) exit from the program by pressing the "Exit" button. The cloud number will remain the same unless the "Accept" button is pushed.
- The "Zoom/Unzoom" button zooms the displayed images/graphics (and button menu) by a factor of 2 each time the button is pushed. Images are zoomed in a cyclic manner to zoom factors of 2, 4, 8, and back to 1. The images are zoomed about the current cursor location such that the cloud feature beneath the cursor at the current zoom factor remains beneath the cursor at the increased zoom factor. In the single point method only, image zooming allows cloud features to be tracked at sub-pixel resolution. That is, the cursor may be placed on any part of the zoomed image pixel and the cursor position will be interpolated within the original unzoomed pixel.

If the "Null Motion Method" of cloud tracking is selected from the IIS button menu, the following IIS button menu will be drawn for the actual cloud tracking process.

	A	B	C	D	F
3	Reselect Cloud	Zoom/ Unzoom	Compute Wind	Switch Method	Exit
2	Fast Loop	Slow Loop	Cursor On/Off	Graphics On/Off	Help
1	Shift All Images	Shift Image 2	Shift Image 3	Shift Image 4	Accept

NULL-MOTION TRACKING BUTTON MENU

Cloud tracking in the Null Motion Method is accomplished generally as follows. Start a loop of the images in the set by pressing either the button "Fast Loop" or "Slow Loop". Choose the cloud to be tracked and press "Reselect Cloud" to stop the loop at Image 1. Move the center of the cursor over the cloud to be tracked and restart the loop. Press the "Shift All Images" button, and MOVE THE CURSOR VERY SLOWLY in the direction opposite to the movement of

the clouds on the screen. It is highly recommended that the CURSOR ARROW BUTTONS are used at this point INSTEAD OF THE TRACKBALL. The reason is that the images are now being shifted according to the movement of the cursor. The first image in the set is never shifted.

In "Shift All Images", when the cursor is moved N # of pixels in a given direction, the second image in the sequence is shifted N pixels in the same direction, the third image is shifted 2*N pixels and the fourth image is shifted 3*N pixels. The object of null motion cloud tracking is to shift the images until the chosen cloud remains nearly motionless under the cursor. When the movement of the cloud has been countered as much as possible by shifting all the images, each of the images 2, 3, and 4 are then shifted individually.

"Shift Image 2" sets up the looping only between Images 1 and 2 in the sequence. Now when the cursor is moved, only Image 2 will be shifted. The buttons "Shift Image 3" and "Shift Image 4" allow the cloud motion to be eliminated between Images 1 and 3, and Images 1 and 4, respectively. After the cloud motion has been removed from each image pair, press "Shift All Images" again while looping to be sure that the motion has been correctly eliminated. When satisfied with the locations, press "Compute Wind" to view the computed results.

IF THE IMAGES BECOME HOPELESSLY SHIFTED DURING THE PROCESS, THE IMAGE SHIFTS CAN BE RESET WITHOUT COMPLETELY EXITING THE PROGRAM by pressing the "Switch Method" button, and again choosing the "Null Motion Method".

The computed results in the Null Motion method will include information about calculated winds from the cursor location determined on each of the shifted images. The user must decide from the calculated winds displayed on the terminal whether to accept or reject the results.

- If the calculated wind is acceptable, press "Accept" and the wind barb or arrow will be drawn on the graphics plane. A new cloud number will be defined for the next cloud. Another cloud may now be tracked by repeating the steps to eliminate its motion on each image in the sequence. The old shifts from the previous null motion measurement will still be applied to the images. The shifts may be reset quickly by pressing "Switch Method" and then coming back into the Null Motion Method.
- If the calculated wind is not acceptable, the user can (1) re-shift the images for the same cloud making any needed corrections, (2) reselect a different cloud on the images and compute a new cloud wind, (3) switch to a different cloud tracking method by pressing the "Switch

Method" button, or (4) exit from the program by pressing the "Exit" button. The cloud number will remain the same unless the "Accept" button is pushed.

- The "Zoom/Unzoom" button zooms the displayed images/graphics (and button menu) by a factor of 2 each time the button is pushed. Images are zoomed in a cyclic manner to zoom factors of 2, 4, 8, and back to 1. The images are zoomed about the current cursor location such that the cloud feature beneath the cursor at the current zoom factor remains beneath the cursor at the increased zoom factor.

Image zooming in the Null Motion Method does not increase the precision of the cloud tracking process. The image shifting is always relative to the original unzoomed image. For example, a one-pixel shift of the cursor results in a one-pixel shift on the screen at zoom factor 1, a two-pixel shift on the screen at zoom factor 2, a four-pixel shift on the screen at zoom factor 4, and so forth.

PROGRAM TKMOVEHT

Measure Motion and Height

FUNCTIONAL DESCRIPTION

TKMOVEHT performs cloud motion and height measurement interactively on the IAT device. The wind velocity and cloud height are computed using satellite navigation information attached to the image set. The resulting cloud vector and height measured by the user are displayed on the graphics plane.

PROGRAM DESCRIPTION

TKMOVEHT TUTOR

PARAMETER	DESCRIPTION
-----	-----
TKIMGSET	Cloud tracking image set number
STARTCLD	Starting cloud number to process 0 - start with new cloud at end of file
DROPIMG	Flag to drop image set
METHOD	Cloud height computation method
COPYHGT	Flag to copy cloud height
GRFTYPE	Graphics type of cloud vector
IRMODE	IR height determination mode
CLDTYPE	Cloud Type
SAMPSIZE	Cloud sample box size

TKIMGSET is the cloud tracking image set number or the cloud file number of the images to be processed. The default image set number is the 'current image set' number stored as a TAE global parameter. The 'current image set' will not be changed if a different number is assigned to this parameter.

STARTCLD specifies the starting cloud number to process in the file. If STARTCLD is set to zero, then TKMOVE will process a new cloud and add it at the end of the dataset.

DROPIMG is a flag to drop the cloud tracking image set on refresh memories. If the image set was previously dropped and is currently displayed on the IAT, the images do not need to be dropped again. The default value of this parameter is 'NO'.

METHOD specifies the method used to measure cloud height. Valid values are 'IR' and 'STEREO', corresponding the IR method and the stereo method, respectively. The default value is 'STEREO'.

COPYHGT is a flag used to indicate whether the cloud height computed for image 1 should be copied to the cloud height slots for the other images in the cloud file. The default value is "YES".

GRFTYPE is the type of graphic symbol used to display cloud vectors. It can be either an arrow or a wind barb. The default is "BARB".

IRMODE is a parameter required for cloud top height determination using the IR method. Two modes are provided:

Mode 1: Cloud height is computed from the grey values from both visible and IR images.
Parameter value = "VI-IR"

Mode 2: Cloud height is computed from the grey value from IR image only.
Parameter value = "IR"

The default value is "IR".

CLDTYPE is required when cloud top height is to be determined by the IR method (METHOD="IR"). There are two cloud types: water cloud or ice cloud. The corresponding parameter values are "WATER" and "ICE". The default value is "WATER".

SAMPSIZE is a value required for cloud top height determination using the IR method (METHOD="IR"). A square box centered at the cloud (cursor) will be used to collect visible and IR grey values for the cloud height computation. The default sample box size is 7 (7x7 screen pixels). The valid range of the box size is from 3 to 15.

TKMOVEHT combines the functions of TKMOVE and TKHGT into one process. In TKMOVEHT, the cloud motion is measured first using the methods and descriptions in TKMOVE. Once a cloud wind has been measured and accepted, the process automatically switches to the methods used in TKHGT, and the height of the cloud just tracked is measured. The interface descriptions of the separate programs TKMOVE and TKHGT are duplicated below in the order in which they appear in TKMOVEHT.

After the proper parameters have been entered and TKMOVEHT is run, the messages:

"Processing cloud no. (number)"

"Press button to select cloud motion measurement method"

will appear on the user terminal, and the following button menu will be drawn on the IIS display:

	A	B	C	D	F
3	Cross Correlation Method	Single Point Method	Null Motion Method		Exit
2					Help
1					

CLLOUD TRACKING METHOD BUTTON MENU

At this point, the user must select one of the three cloud motion measurement methods for the cloud tracking process.

-- Button A3 will select the "Cross Correlation Method" of cloud tracking.

This method uses a pattern recognition technique to automatically determine the position of the chosen cloud on each image in the set. Choose this method only when the cloud pattern is well-structured and slowly changing.

-- Button B3 will select the "Single Point Method" of cloud tracking.

This is a manual cloud tracking method where the user defines the position of the cloud on each image in the set by positioning the cursor on the cloud. Select this method when the cloud feature being traced can be identified with confidence on each image in the sequence.

-- Button C3 will select the "Null Motion Method" of cloud tracking.

In this method, the user "shifts" each image in the sequence so that the cloud feature remains stationary when the images are looped on the display. This method is generally the most accurate cloud tracking method, and is particularly well-suited for use with rapidly-changing clouds or cloud fields.

-- Button F3 ("Exit") terminates the program and returns to the command prompt or the MENU.

-- Button F2 ("Help") will print the functional descriptions of each IIS trackball/button on the user's terminal.

If the "Cross Correlation Method" of cloud tracking is selected from the IIS button menu, the following IIS button

menu will be drawn for the actual cloud tracking process.

	A	B	C	D	F
3	Locate Cloud	Compute Wind	Compute Wind	Switch Method	Exit
2	Fast Loop	Slow Loop	Box On/Off	Graphics On/Off	Help
1	View Base Image 1	View Base Image 2	View Base Image 3	View Base Image 4	Accept

CROSS-CORRELATION TRACKING BUTTON MENU

Cloud tracking in the Cross Correlation Method is accomplished generally as follows. Start a loop of the images in the set by pressing either the button "Fast Loop" or "Slow Loop". Choose the cloud to be tracked and press "View Base Image 1" to stop the loop at the first image in the sequence. Move the center of the cursor over the cloud and press "Locate Cloud". The message

"Cloud located on image no. 1"

will appear on the terminal, and the IIS display will automatically step to the next image in the sequence. This message will appear each time the "Locate Cloud" button is pushed. Move the cursor/box approximately over the cloud on image 2 and press "Locate Cloud" again. Repeat this set of commands for each image in the sequence.

When the cloud has been located on each image in the sequence, start the image loop and note that the cursor follows the cloud locations that have been defined. Make any changes or corrections to the cloud/cursor locations by pressing "View Base Image" for the image to be corrected, move the cursor to the corrected position, and press "Locate Cloud" again. When satisfied with the locations, press "Compute Wind" to view the computed results.

In all cloud tracking methods, a standard terminal display will be used to present the results when "Compute Wind" is performed. There may be up to 4 image pairs (Column 1) in the display, depending on the number of images in the cloud wind set. MEANS and S.D. are the mean and standard deviation of the wind variables for all the image pairs.

The computed results in the Cross Correlation method will

include information about the structure of the cloud patterns within the defined box areas and the calculated winds from the pattern correlations. A high value of the peak to background ratio (close to 1.0) indicates sufficient cloud structure for good pattern correlations. The user must still decide from the calculated winds displayed on the terminal whether to accept or reject the results.

- If the calculated wind is acceptable, press "Accept" and the wind barb or arrow will be drawn on the graphics plane. The program will now proceed to the cloud height measuring technique, where the height of the cloud just tracked may be measured.
- If the calculated wind is not acceptable, the user can (1) re-locate the same cloud on the images making any cursor corrections, (2) locate a different cloud on the images and compute a new cloud wind, (3) switch to a different cloud tracking method by pressing the "Switch Method" button, or (4) exit from the program by pressing the "Exit" button. The cloud number will remain the same unless the "Accept" button is pushed.
- The "Accept" button will not be active until a cloud has been tracked and a wind has been calculated by pressing "Compute Wind".
- The computed wind is immediately written into the cloud wind file when the "Accept" button is pushed. If the wind is found to be in error, the wind vector may be deleted by running TKDEL and marking the bad wind vector for deletion. The same cloud may be tracked more than once whether or not the overlapping vectors have been deleted, although this situation is not recommended.

If the "Single Point Method" of cloud tracking is selected from the IIS button menu, the following IIS button menu will be drawn for the actual cloud tracking process.

	A	B	C	D	F
3	Locate Cloud	Zoom/ Unzoom	Compute Wind	Switch Method	Exit
2	Fast Loop	Slow Loop	Cursor On/Off	Graphics On/Off	Help
1	View Base Image 1	View Base Image 2	View Base Image 3	View Base Image 4	Accept

SINGLE-POINT TRACKING BUTTON MENU

Cloud tracking in the Single Point Method is accomplished generally as follows. Start a loop of the images in the set by pressing either the button "Fast Loop" or "Slow Loop". Choose the cloud to be tracked and press "View Base Image 1" to stop the loop at the first image in the sequence. Move the center of the cursor over the cloud and press "Locate Cloud". The message

"Cloud located on image no. 1"

will appear on the terminal, and the IIS display will automatically step to the next image in the sequence. Move the cursor/box exactly over the cloud feature on image 2 and press "Locate Cloud" again. Repeat this set of commands for each image in the sequence.

When the cloud has been located on each image in the sequence, start the image loop and note that the cursor follows the cloud locations that have been defined. Make any changes or corrections to the cloud/cursor locations by pressing "View Base Image" for the image to be corrected, move the cursor to the corrected position, and press "Locate Cloud" again. When satisfied with the locations, press "Compute Wind" to view the computed results.

The computed results in the Single Point method will include information about calculated winds from the cursor locations on the images. The user must decide from the calculated winds displayed on the terminal whether to accept or reject the results.

-- If the calculated wind is acceptable, press "Accept" and the wind barb or arrow will be drawn on the graphics plane. The program will now proceed to the cloud height measuring technique, where the height of the cloud just tracked may be measured.

- If the calculated wind is not acceptable, the user can (1) re-locate the same cloud on the images making any cursor corrections, (2) locate a different cloud on the images and compute a new cloud wind, (3) switch to a different cloud tracking method by pressing the "Switch Method" button, or (4) exit from the program by pressing the "Exit" button. The cloud number will remain the same unless the "Accept" button is pushed.
- The "Zoom/Unzoom" button zooms the displayed images/graphics (and button menu) by a factor of 2 each time the button is pushed. Images are zoomed in a cyclic manner to zoom factors of 2, 4, 8, and back to 1. The images are zoomed about the current cursor location such that the cloud feature beneath the cursor at the current zoom factor remains beneath the cursor at the increased zoom factor. In the single point method only, image zooming allows cloud features to be tracked at sub-pixel resolution. That is, the cursor may be placed on any part of the zoomed image pixel and the cursor position will be interpolated within the original unzoomed pixel.

If the "Null Motion Method" of cloud tracking is selected from the IIS button menu, the following IIS button menu will be drawn for the actual cloud tracking process.

	A	B	C	D	F
3	Reselect Cloud	Zoom/ Unzoom	Compute Wind	Switch Method	Exit
2	Fast Loop	Slow Loop	Cursor On/Off	Graphics On/Off	Help
1	Shift All Images	Shift Image 2	Shift Image 3	Shift Image 4	Accept

NULL-MOTION TRACKING BUTTON MENU

Cloud tracking in the Null Motion Method is accomplished generally as follows. Start a loop of the images in the set by pressing either the button "Fast Loop" or "Slow Loop". Choose the cloud to be tracked and press "Reselect Cloud" to stop the loop at Image 1. Move the center of the cursor over the cloud to be tracked and restart the loop. Press the "Shift All Images" button, and MOVE THE CURSOR VERY SLOWLY in the direction opposite to the movement of the clouds on the screen. It is highly recommended that

the CURSOR ARROW BUTTONS are used at this point INSTEAD OF THE TRACKBALL. The reason is that the images are now being shifted according to the movement of the cursor. The first image in the set is never shifted.

In "Shift All Images", when the cursor is moved N # of pixels in a given direction, the second image in the sequence is shifted N pixels in the same direction, the third image is shifted $2*N$ pixels and the fourth image is shifted $3*N$ pixels. The object of null motion cloud tracking is to shift the images until the chosen cloud remains nearly motionless under the cursor. When the movement of the cloud has been countered as much as possible by shifting all the images, each of the images 2, 3, and 4 are then shifted individually.

"Shift Image 2" sets up the looping only between Images 1 and 2 in the sequence. Now when the cursor is moved, only Image 2 will be shifted. The buttons "Shift Image 3" and "Shift Image 4" allow the cloud motion to be eliminated between Images 1 and 3, and Images 1 and 4, respectively. After the cloud motion has been removed from each image pair, press "Shift All Images" again while looping to be sure that the motion has been correctly eliminated. When satisfied with the locations, press "Compute Wind" to view the computed results.

IF THE IMAGES BECOME HOPELESSLY SHIFTED DURING THE PROCESS, THE IMAGE SHIFTS CAN BE RESET WITHOUT COMPLETELY EXITING THE PROGRAM by pressing the "Switch Method" button, and again choosing the "Null Motion Method".

The computed results in the Null Motion method will include information about calculated winds from the cursor location determined on each of the shifted images. The user must decide from the calculated winds displayed on the terminal whether to accept or reject the results.

- If the calculated wind is acceptable, press "Accept" and the wind barb or arrow will be drawn on the graphics plane. The program will now proceed to the cloud height measuring technique, where the height of the cloud just tracked may be measured. If a new cloud is tracked directly following the height measurement, the old shifts from the previous null motion measurement will still be applied to the images. The shifts may be reset quickly by pressing "Switch Method" and then coming back into the Null Motion Method.
- If the calculated wind is not acceptable, the user can (1) re-shift the images for the same cloud making any needed corrections, (2) reselect a different cloud on the images and compute a new cloud wind, (3) switch to a different cloud tracking method by pressing the "Switch

Method" button, or (4) exit from the program by pressing the "Exit" button. The cloud number will remain the same unless the "Accept" button is pushed.

- The "Zoom/Unzoom" button zooms the displayed images/graphics (and button menu) by a factor of 2 each time the button is pushed. Images are zoomed in a cyclic manner to zoom factors of 2, 4, 8, and back to 1. The images are zoomed about the current cursor location such that the cloud feature beneath the cursor at the current zoom factor remains beneath the cursor at the increased zoom factor.

Image zooming in the Null Motion Method does not increase the precision of the cloud tracking process. The image shifting is always relative to the original unzoomed image. For example, a one-pixel shift of the cursor results in a one-pixel shift on the screen at zoom factor 1, a two-pixel shift on the screen at zoom factor 2, a four-pixel shift on the screen at zoom factor 4, and so forth.

After the cloud wind has been determined by one of the three tracking methods and the wind has been accepted, TKMOVEHT will then allow the height of the cloud to be measured by the method specified earlier by the Tutor parameter METHOD. If METHOD = "IR", the following button menu will be drawn on the IIS display:

	A	B	C	D	F
3	Locate Cloud		Compute Height		Exit
2	Fast Loop	Slow Loop	Cursor On/Off	Graphics On/Off	Help
1	View Image 1	View Image 2	View Image 2	View Image 4	Accept

IR HEIGHT MEASUREMENT BUTTON MENU

Cloud height computation now proceeds according to the IR height measurement parameters specified in the initial TKMOVEHT Tutor.

The cursor will automatically move to the cloud marker position on Image 1 for the cloud being measured. To compute the height of a cloud using the IR method, the user

simply presses the button labeled "Compute Height", and the height computation results for Image 1 will be displayed on the terminal. If the value of the parameter COPYHGT in the Tutor is "NO", then Image 2 of the sequence will be displayed and the cursor will automatically move to the measured position of the cloud on that image. The user again presses "Compute Height" to calculate the cloud height for Image 2. This process is repeated until the height has been measured on all the images in the set.

If COPYHGT = "YES", the height need only be measured for one image in the sequence, and this height will be copied to the other images in the sequence. Pressing one of the buttons labeled "View Image N" causes Image #N to be displayed on the IIS. The cursor will follow the cloud location on the displayed image, and the "Compute Height" button will use the cursor location on the currently displayed image.

- Once the heights have been computed, the user must either "Accept" the computed values and proceed to the next cloud, or "Exit" to leave the height fields for the cloud at their initial values of zero and exit from the program. The cloud height measurement can be performed again at a later time by running TKHGT (IR and stereo) or TKEDITHT (stereo height only). If COPYHGT = "YES" and the height measurement is accepted, the last height that is computed for the current cloud number will be copied to all images in the set.
- If the measured cloud height is accepted, TKMOVEHT will automatically return to the cloud tracking method last specified to proceed with the tracking and height measurement of the next cloud.

PROGRAM TKOVLAY

Overlay Cloud Vectors on Image

FUNCTIONAL DESCRIPTION

TKOVLAY draws wind barbs/arrows, cloud markers, cloud numbers, and cloud heights to specified graphics planes for overlay on a cloud tracking image set. A graphics plane number may be specified for each variable to be displayed.

A valid image set number must be entered for the parameter TKIMGSET. Entering zero for TKIMGSET will NOT allow the user to select from the image set list, but instead will result in an error message. If the default value for TKIMGSET is not used, the value entered will be used in TKOVLAY, but will not change the default value for TKIMGSET in other programs. Valid values for STARTCLD and ENDCLD must also be entered in the Tutor mode. Values of zero will not allow the user to select from the cloud list.

PROGRAM DESCRIPTION

TKOVLAY TUTOR

PARAMETER	DESCRIPTION
TKIMGSET	Cloud tracking image set number
DROPIMG	Drop image flag
GRFTYPE	Graphic type of the cloud vector
VECTOR	Wind vector element
STARTCLD	Starting cloud number
ENDCLD	Ending cloud number
WINDCLR	Color of wind vector graphics
MARKCLR	Color of cloud marker graphics
NUMCLR	Color of cloud number graphics
HGTCLR	Color of cloud height graphics

TKIMGSET is the cloud tracking image set number or the cloud file number of the cloud image set to be processed. The default image set number is the 'current image set' number stored as a TAE global parameter. The default value for 'current image set' will not change if a different number is assigned to this parameter in this tutor.

DROPIMG is a flag to drop the cloud tracking image set on refresh memories. If the image set was previously dropped and is currently displayed on the IAT, the images do not

need to be dropped again. The default value of this parameter is 'NO'.

GRFTYPE is the type of graphic symbol used to display wind vectors. It can be either an arrow or a wind barb. The default is "BARB".

VECTOR specifies the image pair used to compute the wind vector to be displayed. There are six possible wind vector elements measured from a cloud tracking image set:

VECTOR - 12	vectors measured from images 1 and 2
23	vectors measured from images 2 and 3
34	vectors measured from images 3 and 4
13	vectors measured from images 1 and 3
14	vectors measured from images 1 and 4
24	vectors measured from images 2 and 4

The default value is 14.

STARTCLD specifies the starting cloud number of the cloud vectors to be displayed on the graphics plane. The default value is 1.

ENDCLD is the ending cloud number of cloud vectors to be displayed on the graphics plane. The default value 999 indicates that all cloud vectors in the cloud file are to be displayed.

WINDCLR specifies the color of the wind vectors to be displayed on the graphics plane.

-- If color number is 0, the wind vectors are not drawn.

MARKCLR specifies the color of the cloud location markers to be displayed on the graphics plane.

-- If color number is 0, cloud markers are not drawn.

NUMCLR specifies the color of the cloud numbers to be displayed on the graphics plane.

-- If color number is 0, cloud numbers are not drawn.

HGTCLR specifies the color of the cloud height values to be displayed on the graphics plane.

-- If color number is 0, cloud height is not drawn.

When **TKOVLAY** is run, the chosen graphics will be drawn, all graphics planes will be turned OFF, and the following button menu will be drawn for the IIS buttons:

	A	B	C	D	F
3	Turn On/Off Plane 1	Turn On/Off Plane 2	Turn On/Off Plane 3	Turn On/Off Plane 4	Exit
2	Turn On/Off Plane 5	Turn On/Off Plane 6	Turn On/Off Plane 7	Unused	Define
1	Turn On All Planes	Turn Off All Planes	Unused	Unused	Help

CLOUD GRAPHICS OVERLAY BUTTON MENU

- Buttons A3, B3, C3, D3, A2, B2 and C2 ("Turn On/Off Plane #") turn the graphic plane number # on and off alternately each time the button is pushed. Certain planes will be blank depending on the colors chosen in the tutor for the graphics.
- Button A1 ("Turn On All Planes") turns on graphic planes 1 to 7, whether they are blank or not.
- Button A1 ("Turn Off All Planes") turns off graphic planes 1 to 7.
- Button F1 ("Help") will print the functional descriptions of each IIS trackball/button on the user's terminal.
- Button F3 ("Exit") terminates the program and returns to the command prompt or the MENU.
- Buttons D2, C1, D1, and F2 ("Unused" and "Define") have no effect.

PROGRAM TKREC

Recover Cloud Vectors

FUNCTIONAL DESCRIPTION

TKREC allows the deleted cloud vectors (records) of a specified range to be recovered.

PROGRAM DESCRIPTION

TKREC TUTOR

PARAMETER -----	DESCRIPTION -----
TKIMGSET	Cloud tracking image set number
STARTCLD	Starting cloud number
ENDCLD	Ending cloud number

TKIMGSET is the cloud tracking image set to be processed. The default is the current cloud image set. If you enter the value 0, the list of cloud sets will be displayed and one set number can be selected.

-- The cloud range given by STARTCLD and ENDCLD do not need to be specified before running the program if 0 is entered for the cloud tracking set number.

STARTCLD is the starting cloud number of consecutive cloud vectors to be recovered.

ENDCLD is the ending cloud number of consecutive cloud vectors to be recovered.

If a value of zero is entered for the parameter TKIMGSET, the list of cloud tracking image sets in the current directory will be displayed and the user will be permitted to select a value from the list. The user can select the image set by either entering the reference number of the set from the list column labeled "REF NO.", or entering the set number from the "IMAG SET#" column of the list in the format of S or s followed by the 3-digit number (S234, for example). An asterisk (*) next to the reference number in the listing immediately indicates the currently selected image set.

-- The cloud range given by STARTCLD and ENDCLD do not need to be specified before running the program if 0 is entered

- for the cloud tracking set number.
- Detailed information about an image set is available by entering HELP #, where # is the reference number of the image set.
 - Once the image set has been selected, EXIT to begin recovery.

If both STARTCLD and ENDCLD = '0', a listing of cloud information by number will be produced.

When recovering images from the list, a listing by cloud number of measured cloud parameters is displayed on the terminal. Parameters include: (1) cloud number, (2) image pair for the cloud vectors, (3) speed and (4) direction of cloud motion between the image pair, (5) latitude and (6) longitude of the cloud, (7) IR height, (8) pressure height in mbs, (9) stereo height and (10) stereo height error.

- An asterisk (*) to the left of the cloud number on the listing indicates that the cloud has been flagged as deleted. To recover a cloud, enter the number of the cloud followed by a return.
- Complete detailed information for a cloud can be displayed by entering HELP #, where # is the cloud number in the listing. All information for the cloud for each image and image pair will be displayed.

PROGRAM TKSEL

Select Current Image Set

FUNCTIONAL DESCRIPTION

TKSEL selects the current cloud tracking image set. The new current image set number will be the default value for all the cloud tracking programs.

PROGRAM DESCRIPTION

TKSEL TUTOR

PARAMETER -----	DESCRIPTION -----
TKIMGSET	The new cloud tracking image set number

TKIMGSET specifies the cloud tracking image set number to be used as the default in the cloud tracking programs. The value for TKIMGSET corresponds to the number nnn, where the cloud wind file name is SETnnn.TRK. The value specified for TKIMGSET (the new cloud tracking image set number) will be verified by searching for the corresponding cloud file. If the cloud file does not exist, the current image set number will remain unchanged.

The cloud tracking set catalog will be listed if a value of 0 is entered, and the user will be able to select an image set from those in the listing.

PROGRAM TKSET

Define Cloud Tracking Image Set

FUNCTIONAL DESCRIPTION

TKSET is used to create a new cloud tracking image set by specifying a set of image files.

PROGRAM DESCRIPTION

TKSET TUTOR

PARAMETER -----	DESCRIPTION -----
IMGNUMS	Image numbers
TKSETNAM	Image set name
DESC	Image set description
IMGTYPE	Image type
TIMESEQ	Time sequence flag
SCALEFAC	Wind arrow scale factor

IMGNUMS is a list of image numbers for the base images. A maximum of 4 base image numbers may be specified. At least 1 image number must be specified.

TKSETNAM is the short descriptive name to assign to the image set. The set name can have a maximum length of 8 characters.

DESC is an extended image set description, and may contain a maximum of 36 characters.

IMGTYPE is the cloud set image type. IMGTYPE refers to the type of images available for cloud height measurement. The possible values are 'PSEUDO' and 'STEREO'.

TIMESEQ is a parameter to describe whether images in the cloud set may be used for cloud tracking. Valid values are 'SEQ' for time-sequenced image set (cloud tracking permitted) and 'NO' for non-sequential image set (no tracking possible, for height measurements only).

SCALEFAC is the wind arrow scale factor. SCALEFAC sets the length of wind arrows plotted on the graphics relative to the wind speed. Integer values of 1 or greater are allowed (default=1).

If a value of zero is entered for IMGNUMS(1), the user will be presented with the message:

"Please select up to four base images from the list below:"

followed by the first page of the list of images in the user's default data directory. The user can then select the desired base images from the list by specifying either the reference numbers from the "Ref" column of the list, or the image numbers from the "Name" column of the list (the number value preceded by the letter I: for example, I27).

- To obtain general help information for the terminal display, type HELP followed by a return.
- Detailed information on any image in the list may be obtained by entering HELP followed by the image reference number: for example, HELP 27.
- The CANCEL command permits the base image numbers to be re-entered if a keyboard or other error was made in selection.

PROGRAM TKUPDDIR

Update Cloud Tracking File Directory

FUNCTIONAL DESCRIPTION

TKUPDDIR is used to update the cloud tracking file directory after the conversion of a cloud file to a GEMPAK format file.

PROGRAM DESCRIPTION

TKUPDDIR TUTOR

PARAMETER -----	DESCRIPTION -----
TKSETNO	Cloud Tracking Image Set Number
SNFNAME	GEMPAK Format Cloud File Name
HTYPE	Cloud Height Source or Type

TKSETNO is the cloud tracking image set number of the converted cloud file. The value of TKSETNO is equal to nnn, where the converted cloud file name is SETnnn.TRK .

SNFNAME is the file name assigned to the GEMPAK format converted cloud file.

HTYPE is the cloud height source or type used in the converted GEMPAK cloud file.

2.2 VAS Data Processing

PROGRAM AO2RDS

Create VAS Radiance Dataset from AOIPS Format Tape

FUNCTIONAL DESCRIPTION

AO2RDS creates a radiance dataset from an AOIPS format tape. The AOIPS tape must contain the radiance data in real rather than byte format. Currently, the GARS program can produce this format tape from GARS VAS tapes.

The radiance dataset created may then be used to create imagery or sounding retrievals.

PROGRAM DESCRIPTION

AO2RDS TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
TAPEDRV	Tape Drive Names (MTAO:,MFAO:)
NTAPES	Number of Tapes
STFILE	Number of first file to be processed
NFILES	Number of files to be processed
CHANNELS	VAS channels to put in the radiance dataset
NAVLINK	Navigation File Link
MODE	Mode of VAS data (DWELL or IR/MSI)
SHNAM	Short name for Radiance Dataset
LNNAM	Long name for Radiance Dataset

DISDIR is the disk and directory on which the radiance dataset will be created.

TAPDRV contains the name(s) of the tape drive(s) to be used in this process. Valid tape drive names are "MTAO:" AND "MFAO:". If two tape drive names are entered, the processing will alternate between TAPEDRV(1) and TAPEDRV(2).

Don't issue any mount commands from the terminal; mount

commands will be handled by the software.

NTAPES is the number of AOIPS tapes you will be processing in this session.

STFILE is the number of the first file to be processed in the set of tapes.

NFILES is the number of files to be processed in the set of tapes.

CHANNELS specifies a list of channels to be contained in the radiance dataset. The radiance dataset has a capacity for 32 channels but currently, the VAS instrument has a maximum of 12 channels (numbered 1 through 12).

The channel list is entered as a string of channel numbers separated by semicolons (;). For example, channels 7, 8 and 12 would be specified with "7;8;12"

NAVLINK is the navigation file link. The default value is the current navigation file number. To avoid linking any navigation to the image, use a value of "0"

MODE is the mode of the VAS instrument which took the data. For the VISSR or multispectral imaging modes, use "IR/MSI" and for dwell sounding data, use "DWELL"

SHNAM is a short name used to identify the Radiance Dataset

LNNAM is a long name used to identify the Radiance Dataset

AOIPS TAPE FILE SUBSETTING OPTIONS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
METHOD	Subset center description option (MASTER or GEO)
CLP	Center: line, pixel (default is for whole dataset)
CLL	Center: latitude, longitude (default is for whole dataset)
WLP	Width: dataset line, pixel (default is for whole dataset)

METHOD is the subset center description option.
There are 2 options,

MASTER - describe the center in terms of master
 coordinates

GEO - describe the center in terms of geographic,
latitude, longitude coordinates

CLP is the center master line, pixel of the subset
to be placed in the radiance dataset. If the GEO
option is used, this input is ignored.
The default is the center of the tape dataset.

CLL is the center latitude, longitude of the subset
to be placed in the radiance dataset. If the MASTER
option is used, this input is ignored.
The default is the center of the tape dataset. If
there is no established navigation link to the
radiance dataset, this parameter cannot be specified
and will appear as missing (99999.9).

WLP is the width of the subset in units of the dataset
lines and pixels. The default is to accept the entire
dataset width.

AOIPS TAPE FILE SUBSETTING OPTIONS dynamic tutor allows for
selecting the region of the VAS radiance data to convert
to an AOIPS radiance dataset.

PROGRAM APPACC

Add to Predictand/ Predictor Accumulation File

FUNCTIONAL DESCRIPTION

APPACC lets the user add co-located predictor and predictand data to the predictand/ predictor accumulation file. The radiance predictors used are created by RDSPIK. The locations in the radiance list file are used to select the nearest set of complete surface predictor and upper-air predictand data. Together, this data is added to predictor/ predictand data already in the file. Surface predictors can be taken from the radiance list (containing the proper channel-parameter definition block) instead of from a surface file by specifying '@RADLIS' for the surface file name (ie. for SFFILE).

The predictand/ predictor accumulation file is initialized by running CPPACC. After all the desired times are accumulated with APPACC, the regression matrix is created by running CRGMTX.

Note that a record of the stations accumulated is written in file APPACC.LOG

PROGRAM DESCRIPTION

APPACC TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
PPFILNM	Name of the Predictor/ Predictand accumulation file
RADLIS	Radiance or site list filename
SFFILE	Surface predictor filename (or @RADLIS)
SFTIME	Surface data time
SNFILE	Upper-air predictand filename
SNTIME	Upper-air data time
RADIUS	Surface and upper-air station search radius (in km.)

DISDIR is the disk-directory location of all the input and output files. If different disk-directories are needed for the separate files, leave DISDIR blank ("") and enter the disk-directory name with the file name.

PPFILNM is the name of the Predictor/ Predictand accumulation file. This file was created in program CPPACC and is updated here.

RADLIS is the radiance list filename. This file was created in program RDSPIK. It may also just be a site list file containing no radiances.

SFFILE is the surface predictor filename. Typically, this is a standard GEMPAK surface file which is used here to select the surface predictors. If "@RADLIS" is specified, the program will expect to get surface data from the radiance list file.

SFTIME is the surface data time from which to select the surface data predictors. This is in the GEMPAK date/time format of "YYMMDD/HHMM".

If the surface data file contains only one time, this time may be omitted.

SNFILE is the upper-air predictand filename. This is a standard GEMPAK upper-air file which is used here to select the upper-air predictands.

SNTIME is the upper-air data time from which to select the upper-air data predictands. This is in the GEMPAK date/time format of "YYMMDD/HHMM".

If the upper-air data file contains only one time, this time may be omitted.

RADIUS is the surface and upper-air station search radius. This is the maximum radius around the radiance site in which to accept co-located surface and/ or upper-air data. The default radius is 100 km. Any value between 0 and 10000 km. is valid. Note that a large search radius will make the program run slower.

PROGRAM CPPACC

Create Predictand/ Predictor Accumulation File

FUNCTIONAL DESCRIPTION

CPPACC is the first step of the process to create a regression matrix. CPPACC generates an empty predictor/ predictand accumulation file using the the predictors and predictands specified by the user. In this step, the user specifies which radiances and hourly surface parameters are to be collected as predictors. Also, the user specifies the upper air information which will be collected as predictands. This includes the parameters and the levels of upper- air data. Station parameters (such as lifted index, K index) may be specified instead of level parameters in which case the vertical coordinate, VCOORD is specified as "STA" instead of "PRES". Once an accumulation file is established, APPACC is used to add predictor and predictand data.

NOTE that an accumulation file containing level data cannot contain station data and vice-versa. This is done to prevent confusion in the retrieved data and to separate multi-level from unitary single valued parameters. The CPPACC program CANNOT determine if a mixture has occurred. It will be discovered in APPACC. Make sure all the parameters are the same by checking the GEMPAK Users Guide.

PROGRAM DESCRIPTION

CPPACC TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of file
PPFILNM	Name of the predictor/predictand accumulation file to create
CHANNELS	List of channel predictors
SFPARMS	List of surface predictor parameters
UAPARMS	List of upper-air predictand parameters
UALEVELS	List of upper-air predictand levels
VCOORD	Vertical coordinate (PRES or STA)
RADTYP	Radiance type to accumulate (CGS or BBT)

DISDIR is the disk-directory location of files

PPFILNM is the name of the predictor/ predictand
accumulation file to be created

CHANNELS is the list of channel predictors.
There can be from 0 to 32 channels specified.
The VAS instrument has only 12 channels
numbered consecutively from 1 through 12.
The channels are specified as a list of
numbers separated by semicolons.

SFPARMS is the list of surface predictor parameters.
There can be from 0 to 10 of these parameter
names. Each name is a GEMPAK parameter name
with usually 4 characters. In the parameter
list, the parameters are separated by semicolons.

UAPARMS is the list of upper-air predictand parameters.
There can be from 2 to 10 of these parameter
names. Each name is a GEMPAK parameter name
with usually 4 characters. In the parameter
list, the parameters are separated by semicolons.

UALEVELS is the list of upper-air predictand levels. There
can be from 1 to 50 upper air levels specified. The levels
may be specified in any of the ways that GEMPAK
permits with the exception that a definite set of

not more than 50 levels must be specified.

examples:

1000;850;700	(each level specified)
1000-500-100	(range of levels: from 1000 to 500 mb in 100 mb steps)
VAS or MAN	the standard VAS or mandatory levels

This parameter is ignored if VCOORD is "STA", indicating station parameters.

VCOORD is the vertical coordinate description. The currently available values are "PRES" for pressure level data and "STA" for station parameter data. If station parameters are used, the levels, UALEVELS are ignored as the station data is a non level oriented quantity (such as lifted index or K index).

RADTYP is the radiance type to accumulate. The type can be either CGS or BBT. All accumulated radiances must be in the same form in the accumulation file.

PROGRAM CRGMTX

Create Regression Matrix

FUNCTIONAL DESCRIPTION

CRGMTX, the matrix creation program, actually creates the regression matrix (relating a set of radiance predictors to a set of upper-air predictands) using the data in the predictor /predictand accumulation file. This file was created by program CPPACC and added to by program APPACC.

The regression matrix created here can be used in program RGRETR to produce upper-air sounding retrievals from a set of chosen radiances. The regression coefficients in the matrix may also be used to produce full images of a retrieved parameter by running program RDSIMP.

A list of contribution functions are also generated by this program. The contribution functions show the relative importance of each radiance or surface predictor in determining a particular upper-air parameter.

PROGRAM DESCRIPTION

CRGMTX TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
PPFILNM	Input Predictor/ Predictand accumulation file name
MTXFILNM	Output matrix file name
SVCFCTR	Single conditioning factor
CHCFCTR	Channel specific conditioning factors (chan.; factor)
SFCFCTR	Surface parameter specific conditioning factors (parm.; factor)

DISDIR is the disk-directory location of all the input and output files. If different disk-directories are needed for the separate files, leave DISDIR blank ("") and enter the disk-directory name with the file name.

PPFILNM is the name of the Predictor/ Predictand accumulation file. This file was created in program CPPACC and updated in APPACC.

MTXFILNM is the output regression matrix file name. If this parameter is left empty ("") no regression matrix file is created.

The regression matrix can then be used to make retrievals of upper-air data in RGRETR. Contribution functions may also be derived from the matrix file.

SVCFCTR is the single-valued conditioning factor. This conditioning factor is applied for all the predictors unless it is left empty ("") in which case parameter FCTRLIS is used. A typical value used with VAS radiances is .1.

The conditioning factor is a measure of the inverse of the signal to noise estimate of the predictors. It regulates how closely the regression algorithm tries to fit the regression matrix to the predictors and predictands. A low conditioning factor is used when there is a low amount of noise in the predictors and a high value is used with noisy predictors. A high conditioning factor results in a weaker set of regression matrix coefficients. Thus the retrieval made with this matrix will not be modified from the first guess (the mean of the predictands) as strongly as if a small conditioning factor were used. An infinite conditioning factor would result in a regression matrix which would always give the first guess for any retrieval.

CHCFCTR are the channel specific conditioning factors. These conditioning factors apply to individual channel predictors. Frequently, certain VAS channels will have a higher level of noise in them than other VAS channels. In this case, one would want to specify correspondingly higher conditioning factors to the more noisy channels.

Each channel entry is specified by a string containing the channel number and the conditioning factor separated by a semicolon

e.g.	"1;.01"	channel 1 will have a .01 conditioning
	"2;.1"	factor, 2 has a .1 conditioning factor
	"3;1."	and 3 has a factor of 1.

If a channel is not specified but is in the regression matrix, the conditioning factor is assumed to be 0.0.

SFCFCTR are the surface parameter specific conditioning factors. These conditioning factors apply to individual surface parameter predictors. The surface predictors may have an amount of noise which is different from other surface predictors or from the VAS channel predictors.

In this case, one would want to specify different conditioning factors to the surface predictor parameters.

Each surface parameter entry is specified by a string containing the parameter name and the conditioning factor separated by a semicolon.

e.g. "TEMP;.01" the surface temperature predictor
 "DWPT;.1" will have a .01 conditioning factor
 and the dewpoint parameter will
 have a conditioning factor of .1

If a parameter is not specified but is in the regression matrix, the conditioning factor is assumed to be 0.0.

PROGRAM CRSLIS

Create Site List for Radiance Selection

FUNCTIONAL DESCRIPTION

CRSLIS automatically creates a site list which can then be used in the RDSPIK program to pick a set of radiances at those sites.

Two methods are available, GRID and STATION. In the GRID method, a regularly spaced set of locations in latitude and longitude are generated. In the STATION method, a subset of the station locations in a GEMPAK upper-air dataset are used as locations.

PROGRAM DESCRIPTION

CRSLIS TUTOR

PARAMETER	DESCRIPTION
-----	-----
DISDIR	Disk-directory location of site file
SITELIST	Output file of site locations
METHOD	List creation method (GRID or STATION)
LATRNG	Latitude range to cover
LONRNG	Longitude range to cover
INCLAT	Increment in latitude
INCLON	Increment in longitude
SNFILE	Upper-air STATION file
SNTIME	Upper-air data time

DISDIR is the disk and directory on which the location list will be created.

SITELIST is the name of the site list file. This set of locations is then used in RDSPIK to pick radiances at those sites.

METHOD is the method used to create the location list. There are two methods,

GRID - a regularly spaced set of locations in latitude and longitude are generated with this method.

STATION - In this method, a subset of the station locations in a GEMPAK upper-air dataset are used as locations. If the latitude or longitude ranges are null (--), all stations in the upper-air file are used. Otherwise, only stations in this range are considered.

LATRNG is the latitude range to include. The GRID will start at the low latitude and stop at or before the high latitude. In STATION mode, only locations within the latitude range will be considered for a non-null (--) range.

LONRNG is the longitude range to include. The GRID will start at the low longitude and stop at or before the high longitude. In STATION mode, only locations within the longitude range will be considered for a non-null (--) range.

INCLAT is the latitudinal separation between gridpoints. This variable is not used in STATION mode.

INCLON is the longitudinal separation between gridpoints. This variable is not used in STATION mode.

SNFILE is the name of the upper-air station file to use to describe locations in the STATION mode. Specify the directory location of this file.

SNTIME is the time of the upper-air data to select. This is in the GEMPAK date/time format of "YYMMDD/HHMM". If SNTIME is not specified, the first time in the file is used.

PROGRAM GRDRDS

Convert Grid Parameter to Radiance Dataset Channel

FUNCTIONAL DESCRIPTION

GRDRDS converts one GEMPAK grid into radiance dataset channel.

The grid is interpolated by a polynomial fit to the resolution of the chosen radiance dataset. Any number of grids up to a maximum of 15 (or the remaining number of available radiance dataset channels, maximum = 32) may be added to the radiance dataset. The interpolated grids are given 4 character identifiers which are automatically chosen by the program and may be changed by the user. These parameter names are then associated with a channel number. Once the radiance dataset is created, the associated parameter to a channel may then be found by running SATLIS to display the channel definitions.

PROGRAM DESCRIPTION

GRDRDS TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk directory location
RADFILE	Name of input radiance dataset file (optional)
GRDFIL	Full name of input GEMPAK grid file
NUMGRD	Grid number to use (optional)

DISDIR is the disk directory location of radiance dataset. This directory does not apply to the GEMPAK grid file.

RADFILE is the name of the radiance dataset file. If RADFILE is left null (--), the list of radiance datasets in the current DISDIR are listed and the user is allowed to choose the dataset then.

GRDFIL is the name of GEMPAK grid file to choose the grid from. This file name should be fully specified.

NUMGRD is the grid number to use from the GEMPAK grid file. If this parameter is left null, all the grids in the grid

file will be listed and the user will be asked for the grid number to use then.

SELECT GRID PROCESSING FUNCTION DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
PROTYP	Grid exam / select function (DIR, LAB, NAV, GET, EXIT)
GRDNUM	Grid number to pick

PROTYP is the grid examination / selection function to perform,

"DIR" lists the grids in the grid file that was selected. After the list is made, this tutor is re-presented.

"LAB" lists out the label of the grid. After the list is made, this tutor is re-presented.

"NAV" lists the navigation information for the grid. After the list is made, this tutor is re-presented.

"GET" continues processing of the grid specified by parameter GRDNUM. The new radiance dataset channel is created and the program completes.

"EXIT" permits an exit from further processing at this point.

GRDNUM is the grid number to convert into a radiance dataset channel.

The select grid processing function menu allows examination of the grids available and their labels. The grid number to process is also chosen here.

PROGRAM PWACC

Accumulate Precipitable Water Information

FUNCTIONAL DESCRIPTION

PWACC is the first step in the split window precipitable water retrieval training process. The training defines the average air temperature (T_{air}) to be used in the split window physical model. PWACC collects co-located precipitable water and VAS channel 7 and 8 radiance data that is used to determine T_{air} . The precipitable water is derived from upper-air sounding profiles and the radiances are acquired from the radiance dataset with program RDSPIK.

The precipitable water is in units of millimeters and the radiances are in brightness temperature units.

PROGRAM DESCRIPTION

PWACC TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
RADLIS	Radiance list filename
SNFILE	Upper-air radiosonde filename
SNTIME	Upper-air data time
PWLIST	Output PW list name
LISTOPT	List file option (OLD or NEW)
RADIUS	Upper-air station search radius (in km.)

DISDIR is the disk-directory location of all the input and output files. If different disk-directories are needed for the separate files, leave DISDIR blank ("") and enter the disk-directory name with the file name.

RADLIS is the Input radiance list filename. This file was created in program RDSPIK. VAS channels 7 and 8 must be present to perform the split window process.

SNFILE is the name of the upper-air file from which the precipitable water will be derived.

SNTIME is the upper-air data time from which to select the data. This is in the GEMPAK date/time format of "YYMMDD/HHMM".

If the upper-air data file contains only one time, this time may be omitted.

PWLIST is the name of the file of the list of accumulated precipitable water and radiance data from VAS channels 7 and 8. This is a sequential ASCII file containing the important PW data needed to determine an average air temperature, Tair. It contains one data record per line with the following information:

BBT7, BBT8, SEC, LAT, LON, PW, STID, STNUM
with the following format:
1X,2F9.3,1X,F10.5,1X,2F8.2,1X,F10.4,1X,A4,1X,I7
BBT7 is the brightness temperature in channel 7 (deg K)
BBT8 is the brightness temperature in channel 8 (deg K)
SEC is the secant of the view angle of the satellite
LAT is the site latitude
LON is the site longitude
PW is the precip. water at the nearest raob site (mm)
STID is the station ID of the raob site
STNUM is the station number

LISTOPT determines whether the PW list file (PWLIST) is a new file or if it is an old file to be appended to with more data from other times or locations.

RADIUS is the upper-air station search radius. This is the maximum radius around the radiance site in which to accept co-located upper-air data. The default radius is 100 km. Any value between 0 and 10000 km. is valid. Note that a large search radius will make the program run slower.

PROGRAM RDSAVG

Average a Radiance Dataset

FUNCTIONAL DESCRIPTION

RDSAVG averages a radiance dataset. Each output data point in the averaged dataset is the average of a box of data points surrounding the point in the input dataset. The size of the box can be specified as any number of dataset pixels and lines up to a maximum of 100 pixels and 50 lines. Missing data (values of 99999.9) and points outside the radiance dataset are not considered in the average

The averaging may be performed to either a new dataset or to the input dataset to save space (and destroying the original data in the process).

PROGRAM DESCRIPTION

RDSAVG TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
RDSNAM	Input radiance dataset (optional)
OUTAVG	Output location for averaged data (NEW or INPUT)
WDWAVG	Pixel, line averaging window size
SHNAM	Short name for Radiance Dataset
LNNAM	Long name for Radiance dataset

DISDIR is the disk and directory on which the radiance dataset will be created.

RDSNAM is the input radiance dataset name. If the null default is taken, the radiance dataset directory for the current DISDIR is listed and the radiance dataset may then be chosen from the list.

OUTAVG is the output location for averaged radiance data ("NEW" or "INPUT").

If "NEW" is specified, the results of the dataset averaging are placed in a new radiance dataset on the current default directory.

If "INPUT" is specified, the results of the dataset averaging are placed back in the input radiance dataset. In this case, the original data values are destroyed.

WDWAVG is the size of the averaging window in terms of the radiance dataset pixels and lines. This window size is applied to all the radiance dataset channels. The user has the opportunity to specify individual channel averaging windows later in this program.

SHNAM is a short name used to identify the Radiance Dataset

LNNAM is a long name used to identify the Radiance Dataset

CHANNEL SPECIFIC AVERAGING WINDOWS (PIXEL,LINE) DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
1CHWDW	Channel 1 averaging window
2CHWDW	Channel 2 averaging window
3CHWDW	Channel 3 averaging window
4CHWDW	Channel 4 averaging window
5CHWDW	Channel 5 averaging window
6CHWDW	Channel 6 averaging window
7CHWDW	Channel 7 averaging window
8CHWDW	Channel 8 averaging window
9CHWDW	Channel 9 averaging window
10CHWDW	Channel 10 averaging window
11CHWDW	Channel 11 averaging window
12CHWDW	Channel 12 averaging window
13CHWDW	Channel 13 averaging window
14CHWDW	Channel 14 averaging window
15CHWDW	Channel 15 averaging window
16CHWDW	Channel 16 averaging window
17CHWDW	Channel 17 averaging window
18CHWDW	Channel 18 averaging window
19CHWDW	Channel 19 averaging window
20CHWDW	Channel 20 averaging window
21CHWDW	Channel 21 averaging window
22CHWDW	Channel 22 averaging window
23CHWDW	Channel 23 averaging window
24CHWDW	Channel 24 averaging window
25CHWDW	Channel 25 averaging window
26CHWDW	Channel 26 averaging window
27CHWDW	Channel 27 averaging window
28CHWDW	Channel 28 averaging window
29CHWDW	Channel 29 averaging window
30CHWDW	Channel 30 averaging window
31CHWDW	Channel 31 averaging window
32CHWDW	Channel 32 averaging window

1CHWDW is the size of the averaging window for channel 1 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

2CHWDW is the size of the averaging window for channel 2 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

3CHWDW is the size of the averaging window for channel 3 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

4CHWDW is the size of the averaging window for channel 4 in dataset pixels and lines. The window may have a maximum size

of 100 pixels and 50 lines.

5CHWDW is the size of the averaging window for channel 5 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

6CHWDW is the size of the averaging window for channel 6 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

7CHWDW is the size of the averaging window for channel 7 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

8CHWDW is the size of the averaging window for channel 8 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

9CHWDW is the size of the averaging window for channel 9 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

10CHWDW is the size of the averaging window for channel 10 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

11CHWDW is the size of the averaging window for channel 11 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

12CHWDW is the size of the averaging window for channel 12 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

13CHWDW is the size of the averaging window for channel 13 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

14CHWDW is the size of the averaging window for channel 14 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

15CHWDW is the size of the averaging window for channel 15 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

16CHWDW is the size of the averaging window for channel 16 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

17CHWDW is the size of the averaging window for channel 17 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

18CHWDW is the size of the averaging window for channel 18 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

19CHWDW is the size of the averaging window for channel 19 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

20CHWDW is the size of the averaging window for channel 20 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

21CHWDW is the size of the averaging window for channel 21 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

22CHWDW is the size of the averaging window for channel 22 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

23CHWDW is the size of the averaging window for channel 23 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

24CHWDW is the size of the averaging window for channel 24 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

25CHWDW is the size of the averaging window for channel 25 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

26CHWDW is the size of the averaging window for channel 26 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

27CHWDW is the size of the averaging window for channel 27 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

28CHWDW is the size of the averaging window for channel 28 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

29CHWDW is the size of the averaging window for channel 29 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

30CHWDW is the size of the averaging window for channel 30 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

31CHWDW is the size of the averaging window for channel 31 in dataset pixels and lines. The window may have a maximum

size of 100 pixels and 50 lines.

32CHWDW is the size of the averaging window for channel 32 in dataset pixels and lines. The window may have a maximum size of 100 pixels and 50 lines.

The channel specific averaging tutor allows the input of channel specific averaging windows for the available channels in the radiance dataset. The default is to assign each channel with the window given for the general averaging window. Thus, this tutor may be ignored if the averaging is to be the same for all channels.

PROGRAM RDSIMP

Generate AOIPS images from VAS radiance datasets

FUNCTIONAL DESCRIPTION

RDSIMP creates imagery from the data in a VAS radiance dataset. The image may be made from one channel, from a linear combination of channels or from a non-linear combination of channels 7 and 8 to produce a precipitable water image. Parameter IMGTYPE describes these options in more detail.

The program works in three parts. First, the radiance dataset name and the output image type are gotten. The dataset is opened and specific information is gotten from the user on how to produce the chosen image type. Finally, parameters related to generating the output image from the combined radiance data are gotten. The output image is created and output to either disk or the image terminal.

PROGRAM DESCRIPTION

RDSIMP TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	AOIPS directory/location where images are to be stored
RDSNAM	Name of radiance dataset
IMGTYPE	Type of image to generate

DISDIR is the disk and directory location of the input radiance dataset and the output disk image.

RDSNAM is the name of the VAS radiance dataset to use in creating an image. If no dataset is entered ("--"), a list of the radiance dataset directory for the current DISDIR is presented from which a radiance dataset is chosen.

IMGTYPE is the method used to generate the image from the radiance dataset. There are three main methods described below that are used in creating the output image. For each of these methods, a different tutor menu is presented to obtain specific controls on that method.

The three methods are,

- RLIN - RLIN is the regular linear combination method. This option allows the user to generate an image by combining one or more channels together. Channels can be combined by applying channel coefficients which are user inputs.
- SPLWDW - SPLWDW uses a split window technique to generate a precipitable water image. Channels 7 and 8 are required in the dataset for this technique. The split window model used here is documented in the journal article: "Low-Level Water Vapor Fields from the VISSR Atmospheric Sounder(VAS) 'Split Window' Channels" by Chesters et al., in the Journal of Climate and Applied Meteorology, Vol. 22, No. 5 May 1983.
- MATRIX - MATRIX derives the channel coefficients and bias from a sounding retrieval matrix to make the linear regression retrieval image of a desired parameter.

Acquire Radiance Dataset Parameters DYNAMIC TUTOR

PARAMETER	DESCRIPTION
PIXRED	Pixel reduce factor (Relative to dataset)
LINRED	Line reduce factor (Relative to dataset)
CLAT	Center latitude of image
CLON	Center longitude of image
CPIX	Center pixel of image (In dataset coordinates)
CLIN	Center line of image (In dataset coordinates)
CHAN	Channel number for single channel extraction
UNITS	Image units (CGS or BBT)
BIAS	Channel combination bias
COEF1	Channel 1 coefficient
COEF2	Channel 2 coefficient
COEF3	Channel 3 coefficient
COEF4	Channel 4 coefficient
COEF5	Channel 5 coefficient
COEF6	Channel 6 coefficient
COEF7	Channel 7 coefficient
COEF8	Channel 8 coefficient
COEF9	Channel 9 coefficient
COEF10	Channel 10 coefficient
COEF11	Channel 11 coefficient
COEF12	Channel 12 coefficient
COEF13	Channel 13 coefficient
COEF14	Channel 14 coefficient
COEF15	Channel 15 coefficient
COEF15	Channel 15 coefficient
COEF16	Channel 16 coefficient
COEF17	Channel 17 coefficient
COEF18	Channel 18 coefficient
COEF19	Channel 19 coefficient
COEF20	Channel 20 coefficient
COEF21	Channel 21 coefficient
COEF22	Channel 22 coefficient
COEF23	Channel 23 coefficient
COEF24	Channel 24 coefficient
COEF25	Channel 25 coefficient
COEF26	Channel 26 coefficient
COEF27	Channel 27 coefficient
COEF28	Channel 28 coefficient
COEF29	Channel 29 coefficient
COEF30	Channel 30 coefficient
COEF31	Channel 31 coefficient
COEF32	Channel 32 coefficient

PIXRED is the pixel reduce factor relative to the VAS dataset that the user desires to be used to generate the AOIPS image. By default, the program will attempt to set this parameter such that the generated image will fill as much of the IAT screen as possible while preserving a line/pixel aspect ratio of unity. NOTE to generate a zoom image of the dataset, specify this parameter as negative.

LINRED is the pixel reduce factor relative to the VAS dataset that the user desires to be used to generate the AOIPS image. By default, the program will attempt to set this parameter such that the generated image will fill as much of the IAT screen as possible while preserving a line/pixel aspect ratio of unity. NOTE to generate a zoom image of the dataset, specify this parameter as negative.

CLAT is the latitude within the dataset about which the generated image will be centered. By default this latitude will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified.

CLON is the longitude within the dataset about which the generated image will be centered. By default this longitude will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified.

CPIX is the pixel within the dataset about which the generated image will be centered. By default this pixel will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified. Also, if both the center line/pixel and lat/lon are changed by the user, the line/pixel takes precedence.

CLIN is the line within the dataset about which the generated image will be centered. By default this line will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified. Also, if both the center line/pixel and lat/lon are changed by the user, the line/pixel takes precedence.

CHAN is the single channel number the user wishes to extract if he only wishes to extract one channel. If the user wishes to combine more than one channel, he should specify this parameter as the NULL string. Then he should specify the coefficients of the desired channels (COEF) as non-zero.

NOTE: By default this parameter is set to "8" (channel 8) if it exists in the dataset, else it is set to the first channel number stored in the dataset. The channels stored in the dataset can be determined by seeing which coefficients are displayed.

UNITS specifies the units the user desires to scale to the grey values. By default, units is set to the units stored in the dataset. If the user wishes to change the units for scaling to the grey values, he can specify a valid units name and the software will make the appropriate units conversion using the Planck function.

There are two valid field units:

- 1) "CGS" which is radiance in cgs units, i.e.,
ergs/cm²-strad-wave_number
- 2) "BBT" which is black-body temperature in
units of deg Kelvin

BIAS is a value that can be added to the linear combination of channels when channels are being combined.

COEF1 - COEF32 is the coefficient for the corresponding channel number. This parameter is used for weighting this channel if a linear combination of channels is desired. This parameter will only appear if this channel is in the dataset. NOTE: The CHAN parameter MUST be set to the NULL string for the software to linearly combine more than one channel. If it is not, the channel coefficients are ignored and only the channel specified in CHAN is extracted.

The acquire radiance dataset parameters dynamic tutor is presented when "RLIN" is entered for the IMGTYP parameter in the main tutor. With this tutor, any one VAS channel or any linear combination of VAS channels may be chosen to be used in creating a display image. The location and resolution of the data to choose is also specified here.

The program uses these inputs to gather and combine the radiances. The image generation parameter tutor then is presented to control how the combined radiances are output.

Image generation parameters DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
DEVICE	Output device (IAT,DISK,or BOTH)
LOSCALE	Minimum field value to scale
HISCALE	Maximum field value to scale
LOGREY	Minimum grey value to map field value
HIGREY	Maximum grey value to map field value
DESCRIP	Image description (up to 48 characters)

DEVICE is the output device on which the image will be put. "IAT" will put the image on the interactive terminal (if the terminal has been allocated), "DISK" will create a disk image file on the current DISDIR and "BOTH" will put the image in both places.

LOSCALE is the minimum field value, i.e., radiance (CGS) or black-body temperature (BBT) that will be scaled into the grey value range. NOTE: Field values less than loscale are set to loscale.

The following equation is used to scale the field values into the image grey values:

$$\text{imaggrey} = (\text{field value} - \text{loscale}) * \text{f2grey} + \text{logrey}$$

$$\text{where } \text{f2grey} = (\text{higrey} - \text{logrey}) / (\text{hiscale} - \text{loscale})$$

HISCALE is the maximum field value, i.e., radiance (CGS) or black-body temperature (BBT) that will be scaled into the grey value range. NOTE: Values greater than the maximum value are set to the maximum value.

The following equation is used to scale the field values into the image grey values:

$$\text{imaggrey} = (\text{field value} - \text{loscale}) * \text{f2grey} + \text{logrey}$$

$$\text{where } \text{f2grey} = (\text{higrey} - \text{logrey}) / (\text{hiscale} - \text{loscale})$$

LOGREY is the minimum grey value of the range of grey values that the field values, i.e. radiance (CGS) or black-body temperature (BBT), will be scaled to. NOTE: Missing field values are set to the grey value of zero.

The following equation is used to scale the field values into

the image grey values:

$$\text{imaggrey} = (\text{field value} - \text{loscale}) * \text{f2grey} + \text{logrey}$$

$$\text{where } \text{f2grey} = (\text{higrey} - \text{logrey}) / (\text{hiscale} - \text{loscale})$$

HIGREY is the maximum grey value of the range of grey values that the field values, i.e. radiance (CGS) or black-body temperature (BBT), will be scaled to.

The following equation is used to scale the field values into the image grey values:

$$\text{imaggrey} = (\text{field value} - \text{loscale}) * \text{f2grey} + \text{logrey}$$

$$\text{where } \text{f2grey} = (\text{higrey} - \text{logrey}) / (\text{hiscale} - \text{loscale})$$

DESCRIP is a description of the image which will be stored in the image label.

The image generation parameters dynamic tutor is concerned with the information needed to convert the combined radiance dataset channel values into the actual bytes representing those values in the image. The destination of the image created is also decided here.

Acquire Radiance Dataset Parameters Using Matrix DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
MTXNAM	Matrix file name
PIXRED	Pixel reduce factor (Relative to dataset)
LINRED	Line reduce factor (Relative to dataset)
CLAT	Center latitude of image
CLON	Center longitude of image
CPIX	Center pixel of image (In dataset coordinates)
CLIN	Center line of image (In dataset coordinates)

MTXNAM is the matrix file name. The matrix is used to generate the appropriate coefficients and bias to generate the image from the radiance dataset

PIXRED is the pixel reduce factor relative to the VAS dataset that the user desires to be used to generate the AOIPS image. By default, the program will attempt to set

this parameter such that the generated image will fill as much of the IAT screen as possible while preserving a line/pixel aspect ratio of unity. NOTE to generate a zoom image of the dataset, specify this parameter as negative.

LINRED is the pixel reduce factor relative to the VAS dataset that the user desires to be used to generate the AOIPS image. By default, the program will attempt to set this parameter such that the generated image will fill as much of the IAT screen as possible while preserving a line/pixel aspect ratio of unity. NOTE to generate a zoom image of the dataset, specify this parameter as negative.

CLAT is the latitude within the dataset about which the generated image will be centered. By default this latitude will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified.

CLON is the longitude within the dataset about which the generated image will be centered. By default this longitude will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified.

CPIX is the pixel within the dataset about which the generated image will be centered. By default this pixel will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified. Also, if both the center line/pixel and lat/lon are changed by the user, the line/pixel takes precedence.

CLIN is the line within the dataset about which the generated image will be centered. By default this line will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified. Also, if both the center line/pixel and lat/lon are changed by the user, the line/pixel takes precedence.

The acquire radiance dataset parameters using matrix dynamic tutor is presented when "MATRIX" is entered for the IMGTYPE parameter in the main tutor. With this tutor, a linear regression retrieval image is generated. A set of coefficients in the regression matrix provides the channel coefficients and bias necessary to create an image of a desired meteorological parameter. The location and resolution of the data to choose is also specified here.

The program uses these inputs to gather and combine the radiances. The image generation parameter tutor then is presented to control how the combined radiances are output.

Acquire Precipitable Water Parameters DYNAMIC TUTOR

PARAMETER	DESCRIPTION
PIXRED	Pixel reduce factor (Relative to dataset)
LINRED	Line reduce factor (Relative to dataset)
CLAT	Center latitude of image
CLON	Center longitude of image
CPIX	Center pixel of image (In dataset coordinates)
CLIN	Center line of image (In dataset coordinates)
TAIR	Average air temperature
THRPW	Precipitable water high threshold (mm)
THRTA7	Channel 7 threshold
THRTA8	Channel 8 threshold
THR78	Combined channel threshold
KDELO	Dry absorption coef (zero order)
KDEL1	Dry absorption coef (first order)
ADELO	Wet absorption coef (first order)
ADEL1	Wet absorption coef (second order)

PIXRED is the pixel reduce factor relative to the VAS dataset that the user desires to be used to generate the AOIPS image. By default, the program will attempt to set this parameter such that the generated image will fill as much of the IAT screen as possible while preserving a line/pixel aspect ratio of unity. NOTE to generate a zoom image of the dataset, specify this parameter as negative.

LINRED is the pixel reduce factor relative to the VAS dataset that the user desires to be used to generate the AOIPS image. By default, the program will attempt to set this parameter such that the generated image will fill as much of the IAT screen as possible while preserving a line/pixel aspect ratio of unity. NOTE to generate a zoom image of the dataset, specify this parameter as negative.

CLAT is the latitude within the dataset about which the

generated image will be centered. By default this latitude will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified.

CLON is the longitude within the dataset about which the generated image will be centered. By default this longitude will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified.

CPIX is the pixel within the dataset about which the generated image will be centered. By default this pixel will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified. Also, if both the center line/pixel and lat/lon are changed by the user, the line/pixel takes precedence.

CLIN is the line within the dataset about which the generated image will be centered. By default this line will correspond to the center of the dataset. NOTE that the center of the resulting AOIPS image may be somewhat different than this value if reducing or zooming of the dataset is specified. Also, if both the center line/pixel and lat/lon are changed by the user, the line/pixel takes precedence.

TAIR is the average air temperature (in degrees Kelvin) to use in the split window calculations.

THRPW is the high threshold value of precipitable water in millimeters. Estimates from the split window calculation above this value are set to the missing value (zero grey value).

THRTA7 is the channel 7 temperature threshold (T7). If $T7 < TAIR + THRTA7$, then the precipitable water estimate for the corresponding pixel is set to the missing value (zero grey value).

THRTA8 is the channel 8 temperature threshold (T8). If $T8 < TAIR + THRTA8$, then the precipitable water estimate for the corresponding pixel is set to the missing value (zero grey value).

THR78 is the threshold value between channel 7 and 8 temperature. If $T8 < T7 + THR78$ then the precipitable water estimate for the corresponding pixel is set to the missing value (zero grey value).

KDELO is the zero order dry absorption coefficient.

KDEL1 is the first order dry absorption coefficient.

ADELO is the first order wet absorption coefficient.

ADEL1 is the second order wet absorption coefficient.

The acquire precipitable water parameters dynamic tutor is presented when "SPLWDW" is entered for the IMGTYP parameter in the main tutor. The "SPLWDW" option runs the generation of precipitable water images using the split-window technique. The average air temperature is chosen here as well as a number of semi-permanent constants used in the calculation. The location and resolution of the data to choose is also specified here.

VAS channels 7 and 8 are required in the split window calculations. The split window technique used here is documented in journal article "Low-Level Water Vapor Fields from the VISSR Atmospheric Sounder (VAS) 'Split Window' Channels" by Chesters et al., Journal of Climate and Applied Meteorology, Vol. 22, No. 5, May 1983.

Precipitable water is displayed in the units of millimeters.

The program uses these inputs to gather and combine the radiances. The image generation parameter tutor then is presented to control how the combined radiances are output.

PROGRAM RDSPIK

Radiance Selection

FUNCTIONAL DESCRIPTION

The radiance acquisition program RDSPIK, allows the user to pick radiances from a radiance dataset for a set of sites. Two modes; an interactive, image oriented mode and a non-interactive mode, are accessed from the same PDF.

In the interactive mode, an image (and possibly two) is used to identify the location of the desired radiances. The locations may be chosen in any of three ways: from a user-supplied input list, interactively entered by specifying the geographic or master location, or by using the cursor location on the image. In any case, the radiances are gathered, thresholded and averaged to produce a final list of radiances. The radiances and the standard deviation over the Sounding Field-Of-View (SFOV) are displayed on the terminal and the cursor is placed at the chosen point on the image. The user is given the opportunity to flip through the primary and secondary images if two images were specified. The user may also accept or reject the set of radiances. An accepted location is marked on the image by a small cross in the graphics plane. All accepted radiances are placed in a radiance list dataset for use in either constructing a retrieval matrix or in creating meteorological parameter retrievals.

The non-interactive mode functions in much the same way as the interactive mode. The radiance dataset is selected directly, no reference image is used. Locations may be specified only through a site list. Averaged radiances chosen are written-out to the radiance file with no opportunity for the user to accept or reject.

PROGRAM DESCRIPTION

RDSPIK TUTOR

PARAMETER	DESCRIPTION
-----	-----
DISDIR	Disk directory location
IATFLAG	Interactive/Non-interactive Flag (YES - interactive)
SITELIST	Input file of sites to sound
RADLIST	Output filename for the radiance list
RADFILE	Name of radiance dataset file (NON-INTERACTIVE mode only)
SSFOVSZ	Pixel, line size of Sub-Sounding Field-of-View
NSSFOV	Number of Sub-Sounding Field-of-View columns and rows
THRLIS	SSFOV threshold string list for 12 channels (optional) (ChID;low;hi;std dev)

DISDIR is the Disk directory location for the input image.

IATFLAG is Interactive/Non-interactive Flag. If IATFLAG is "YES" the interactive mode is used in which radiances are selected with the aid of one or two images created from the VAS radiance dataset. If IATFLAG is "NO", a site list file is used to select radiances from the VAS radiance dataset.

SITELIST is the input file of sites to sound. The file structure is a subset of the radiance list file structure. The file is an ASCII file.

first line: 0, LFLG

LFLG is the location type flag:

0 - latitude, longitude

1 - master line, pixel

format 1X,2(I2,1X)

second line to end: line/latitude, pixel/longitude

format 1X,2F10.2

RADLIST is the output filename for the radiance list.

RADFILE is the name of radiance dataset file. If this is left empty, the user will be asked to choose the radiance dataset from the radiance dataset directory.

SSFOVSZ is the pixel/line size of the Sub-Sounding

Field-of-View (SSFOV)

NSSFOV is the number of Sub-Sounding Field-of-View columns and rows.

THRLIS is a list of screening thresholds to apply to each channel SSFOV (Sub-Sounding Field-Of-View). If entries are not designated for a channel, a default set of loose thresholds are used. Each entry is a string describing the thresholds for one channel. The format for each entry is:

CH#;LOW;HI;STDEV

where CH# is the channel on which to apply thresholds
LOW is the low threshold value
HI is the high threshold value
STDEV is the maximum acceptable standard deviation

The default thresholds for all channels are;

LOW - -10.0
HIGH - 250.0
STDEV - 30.0

PROGRAM RGRETR

Create Sounding Retrievals from VAS Radiances

FUNCTIONAL DESCRIPTION

RGRETR uses a regression matrix to produce upper-air sounding retrievals from a set of VAS radiances and/or surface predictor data. The surface data may be accessed from a GEMPAK surface file or from a radiance list file incorporating surface data.

The radiances are selected with program RDSPIK.

The regression matrix is generated using a set of programs which relate a set of VAS radiances and / or hourly surface data (the predictors) to co-located upper-air data (the predictands). First, a predictor/predictand accumulation file is defined and created in program CPPACC. Then, the predictor and predictand data are accumulated in program APPACC. When all the desired predictor and predictand data are accumulated, a retrieval matrix is created with program CRGMIX. The matrix can then be used here to create upper-air retrievals.

PROGRAM DESCRIPTION

RGRETR TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
MTXFILNM	Input matrix file name
RADLIS	Radiance list filename
SNOUT	Upper-air retrieval filename
RTRDSC	12 character retrieval name
SFFILE	Surface predictor filename (optional or @RADLIS)
SFTIME	Surface data time
RADIUS	Surface station search radius (in km.)

DISDIR is the disk-directory location of all the input and output files. If different disk-directories are needed for the separate files, leave DISDIR blank ("") and enter the disk-directory name with the file name.

MTXFILNM is the input regression matrix file name.

This file contains the actual regression matrix and the mean of the predictors and predictands used to make the matrix. The RMS of the predictors is also stored in the matrix file to allow the computation of contribution functions.

RADLIS is the radiance list filename. This file was created in RDSPIK, the radiance selection program. It is necessary to specify a radiance list file regardless of whether any radiance predictors are required for the retrieval. In addition to supplying radiances, the radiance list file supplies the locations at which to produce retrievals.

SNOUT is the upper-air retrieval filename. This is a standard GEMPAK upper-air file which is used here to contain the sounding retrievals.

RTDSC is the descriptive name given to the upper-air dataset being retrieved. It is stored as a part of the GEMPAK upper-air file.

SFFILE is an optional surface predictor filename. Typically, this is a standard GEMPAK surface file which is used here to select the surface predictors. If "@RADLIS" is specified, the program will obtain surface data from the radiance list file.

SFTIME is the surface data time from which to select the surface data predictors. This is in the GEMPAK date/time format of "YYMMDD/HHMM" (or proper abbreviated versions).

If the surface data file contains only one time, this time may be omitted. This parameter is ignored if no surface file is specified.

RADIUS is the surface station search radius. This is the maximum radius around the radiance site in which to accept co-located surface data. The default radius is 100 km. Any value between 0 and 10000 km. is valid. Note that a large search radius will make the program run slower. This parameter is ignored if no surface file is specified.

PROGRAM SATLIS

List Satellite Radiance Dataset Directory

FUNCTIONAL DESCRIPTION

SATLIS lists-out the contents of the satellite radiance directory to the display screen.

PROGRAM DESCRIPTION

SATLIS TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Image group location

INGROUP is the location of the satellite radiance directory file in the syntax of the host operating system. The default value is the current AOIPS/2 file location.

PROGRAM SWTRN

Split Window Training to get Average Air Temperature

FUNCTIONAL DESCRIPTION

SWTRN derives an estimate of the average air temperature, T_{air} from a set of VAS channel 7 and 8 radiances and co-located raob-derived precipitable water values. This set of co-located data was gathered previously in program PWACC. The average air temperature may then be used in RDSIMP to create a precipitable water image or it may be used in SWRTR to retrieve PW at point locations.

The average air temperature is displayed along with statistics relating to the goodness-of-fit of the solution found. The file SWTRN.LOG also contains this information along with more details about the screening and minimization process.

The average air temperature is computed in a two-step process. The first screening step attempts to screen out bad data samples from the list of co-located PW and radiance data. The data can be bad due to noise or cloud contamination or poorly computed PW. This step derives both the air temperature and PW at all the sites to aid in the screening process. More detail about this process may be found in the paper: Low-level Water Vapor Fields from the VISSR Atmospheric Sounder (VAS) "Split Window" Channels by Chesters et. al., JCAM 22 No. 5, May 1983. The second step takes the screened data and determines the average air temperature which best reduces the RMS difference between the raob PW and the PW retrieved using that air temperature. The minimization process was found to get better values of air temperature than through the screening method alone (see the paper: Optimized Retrievals of Precipitable Water from the VAS "Split Window" by Chesters et. al., JCAM 26 No. 8, Aug 87).

PROGRAM DESCRIPTION

SWTRN TUTOR

PARAMETER	DESCRIPTION
-----	-----
DISDIR	Disk-directory of files
PWLIST	File containing co-located raob PW and VAS radiances
KDELO	Dry absorption coef (zero order)
KDEL1	Dry absorption coef (first order)
ADELO	Wet absorption coef (first order)
ADEL1	Wet absorption coef (second order)
THRTA7	Channel 7, Tair threshold
THRTA8	Channel 8, Tair threshold
THR78	Channel 7, 8 threshold
THRPW	Precipitable water high threshold (mm)

DISDIR is the disk-directory location of the PW list file.

PWLIST is the name of the input file of accumulated precipitable water and radiance data from VAS channels 7 and 8. This is a sequential ASCII file containing the important PW data needed to determine an average air temperature, Tair. It contains one data record per line with the following information:

BBT7, BBT8, SEC, LAT, LON, PW, STID, STNUM
with the following format:
1X,2F9.3,1X,F10.5,1X,2F8.2,1X,F10.4,1X,A4,1X,I7

BBT7 is the brightness temperature in channel 7 (deg K)
BBT8 is the brightness temperature in channel 8 (deg K)
SEC is the secant of the view angle of the satellite
LAT is the site latitude
LON is the site longitude
PW is the precip. water at the nearest raob site (mm)
STID is the station ID of the raob site
STNUM is the station number

KDELO is the zero order dry absorption coefficient.

KDEL1 is the first order dry absorption coefficient.

ADEL0 is the first order wet absorption coefficient.

ADEL1 is the second order wet absorption coefficient.

THRTA7 is the channel 7 temperature threshold (T7). If $T7 < TAIR + THRTA7$, then the screening steps will exclude that site from the Tair derivation process.

THRTA8 is the channel 8 temperature threshold (T8). If $T8 < TAIR + THRTA8$, then the screening steps will exclude that site from the Tair derivation process.

THR78 is the threshold value between channel 7 and 8 temperature. If $T8 < T7 + THR78$ than the screening steps will exclude that site from the Tair derivation process.

THRPW is the high threshold value of precipitable water. The screening steps will exclude that site from the Tair derivation process. This threshold is in millimeters of precipitable water.

PROGRAM SWRTR

Split Window Precipitable Water Retrieval

FUNCTIONAL DESCRIPTION

SWRTR retrieves precipitable water (in mm.) and places it in a GEMPAK surface file (with name PWTC for total column precipitable water). The average air temperature, Tair can be derived using the program SWTRN.

PROGRAM DESCRIPTION

SWRTR TUTOR

PARAMETER	DESCRIPTION
-----	-----
DISDIR	Disk-directory of files
RADLIS	Radiance list filename
TAIR	Average air mass temperature
SFCFIL	Output retrieved PW data
KDELO	Dry absorption coef (zero order)
KDEL1	Dry absorption coef (first order)
ADELO	Wet absorption coef (first order)
ADEL1	Wet absorption coef (second order)

DISDIR is the disk-directory location of the PW list file.

RADLIS is the Input radiance list filename. This file was created in program RDSPIK. VAS channels 7 and 8 must be present to perform the split window process.

TAIR is the average air temperature of the air mass. The value of TAIR can be derived from the program SWTRN which determines the TAIR from a set of co-located VAS radiances and radiosonde determined precipitable water. TAIR is also found to be close to the average of the 700 mb temperatures.

SFCFIL is the name of the output surface file in which the precipitable water will be placed. The precipitable water is in units of mm.

KDELO is the zero order dry differential absorption coefficient.

KDEL1 is the first order dry differential absorption coefficient.

ADELO is the first order wet differential absorption coefficient.

ADEL1 is the second order wet differential absorption coefficient.

2.3 SSM/I Data Processing

PROGRAM LTDDEL

Delete a Location Tagged Dataset

FUNCTIONAL DESCRIPTION

LTDDEL deletes a location tagged dataset from the location tagged dataset directory. The files on disk will be deleted, and the directory will be updated accordingly.

PROGRAM DESCRIPTION

LTDDEL TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk/directory location

DISDIR specifies the disk/directory location of the directory of interest.

PROGRAM SSMIMAP

Remap SSM/I Data to Map Coordinates

FUNCTIONAL DESCRIPTION

SSMIMAP remaps SSM/I data to any of 9 map projections supported by GEMPAK including the GOES projection. SSM/I data in the form of a location tagged dataset is used for the input and an image is created on either the disk or the image terminal.

SSMIMAP will support the use of multiple input SSM/I datasets. If the SSM/I datasets are explicitly specified in the DSNAM parameter, only those datasets will be remapped. If no datasets are explicitly specified, the program will ask for the name of each new dataset to be remapped. When all the desired datasets have been entered, EXIT should be entered to complete the processing. Up to 10 SSM/I datasets may be remapped to one image.

Note on using the GOES projection. When using the GOES projection to map to, the name of a GOES image is required. The image supplied and its associated navigation file must reside on the default directory used. The image name (without directory) is placed in the GAREA parameter and the projection is 'AOI'.

Note on placing a map on the map projection images. GEMPLT assumes a margin of 3 character lines (which depends on character size) when plotting a map. The images created by SSMIMAP have no margin. Thus, unless special care is taken, a GEMPLT map will not lie correctly over the SSM/I image. In order to draw a map correctly, do the following procedure,

1. Exit GEMPLT. Do this by running GPEND. This step may be omitted if it is certain that GEMPLT was not invoked previously in the current session.
2. Set zero text size. Tutor GPTEXT and make sure
TEXSIZ = 0
3. Set up the projection and bounds. You must remember the map bounds chosen for this remap. Tutor on GPSETUP
4. If the data is in the Eastern Hemisphere, you may have to set up a different map. Tutor on GPMFIL. The file GP\$MAPS:MEPOWO.GSF will do political boundaries over the whole world with medium resolution.
5. Plot the map. Tutor on GPMAP. Finis.

PROGRAM DESCRIPTION

SSMIMAP TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
GAREA	GEMPAK lat, lon range low;left;up;right (or img name)
CHANNEL	SSM channel(s) to remap <CH 1>;<CH 2>;...
PROJ	Map projection to map to (MER, NPS, LCC, MCD, AOI ...)
DEVICE	Output device for image (DISK, IAT or BOTH)
SHNAM	Short name for image
LNNAM	Long name for image
DSNAM	Name of input SSM/I dataset

DISDIR is the disk-directory location of the input SSM/I image and the output SSM/I remapped image. It is also used for the input GOES image if remapping is done to GOES projection

GAREA is the latitude, longitude area in which to map the SSM/I data. It is in GEMPAK format :

<lower latitude>;<left longitude>;<upper lat.>;<right long.>
If PROJ is 'AOI' then GAREA is the name of a GOES image to which the SSM/I data will be remapped. The GOES image must be in the default disk/ directory.

CHANNEL describes the channels in the SSM/I dataset to process into images. Channels from the SSM/I instrument are currently designated in the following way,

CHANNEL:	1	2	3	4	5	6	7
SSM/I channel:	19H	19V	22V	37H	37V	85H	85V

The CHANNEL parameter is entered in the GEMPAK format with channels separated by semicolons. For example, to produce images of the 37V, 85H and 85V channels, enter,

CHANNEL - 5;6;7

PROJ is the map projection to map the SSM/I data into.
There are 9 projections that GEMPLT handles:

MER	Mercator
UTM	Universal Transverse Mercator
NPS	North Polar Stereographic
SPS	South Polar Stereographic
LCD	Lambert Conic Conformal
SCC	Lambert Conic Conformal Southern Hemisphere
CED	Cylindrical Equidistant
MCD	Modified Cylindrical Equidistant
AOI	GOES image projection

Device is the output device to put the created image. It may be IAT for the image terminal, DISK for a disk output or BOTH to put the image to both.

SHNAM is the short (8 character) name given to the image.

LNNAM is the long (48 character) name given to the image.

DSNAM is the name of input SSM/I dataset. If this entry is left empty or null, a list of the available datasets in the location tagged dataset directory is displayed and the desired dataset can be located and chosen.

PROGRAM SSMIMG

Create Raw Image of SSM/I data

FUNCTIONAL DESCRIPTION

The SSMIMG program creates a raw image of a section of the data in an SSM/I dataset. The image is in 'raw' form. That is to say that the data in the image appears in the way it was taken; image pixels are pixels in either the 'A' or 'B' scans and lines are the successive 'A' and 'B' scans. All images are painted in such a way that the top of the image is to the north and the left of the image is to the west. This definition is computed from the change of latitude on the first scans requested so the top of the image will follow this convention even if the bottom doesn't (in the case of a traverse over the pole in the image). The images created are all 128 pixels wide with the low resolution SSM/I channel pixels and lines duplicated. The image created contains 512 lines or as many lines as are left in the dataset following the start time.

PROGRAM DESCRIPTION

SSMIMG TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
DSNAM	Name of input SSM/I dataset
STARTIME	Start time to process (MMDD,HHMMSS)
CHANNEL	Channel(s) to process (<ch1>;<ch2>...)
DEVICE	Output device (IAT, DISK or BOTH)
SHNAM	Short name for image
LNNAM	Long name for image

DISDIR is the disk-directory location of the input level I correction file and the output SSM/I dataset.

DSNAM is the name of input SSM/I dataset. If this entry is left empty or null, a list of the available datasets in the location tagged dataset directory is displayed and the desired dataset can be located and chosen.

STARTIME is the start of the time range of the SSM/I data to

extract from the Wentz tape. Enter both the month, day (MMDD) and the hour, minute, second (HHMMSS) at which to start.

If STARTIME is left null ("--"), the program will display the time range of the chosen dataset and request a start time.

CHANNEL is the channel list in the SSM/I dataset to process into images. Channels from the SSM/I instrument are currently designated in the following way,

CHANNEL:	1	2	3	4	5	6	7
SSM/I channel:	19H	19V	22V	37H	37V	85H	85V

The channel parameter is entered in the GEMPAK format with channel numbers separated by semicolons. For example, to produce images of the 37V, 85H and 85V channels, enter,

CHANNEL - 5;6;7

DEVICE is the output device on which to place the raw SSM/I image. Either the image display (IAT) or a disk file (disk) or both (BOTH) may be specified.
(IAT, DISK or BOTH)

SHNAM is the short (8 character) name given to the image.

LNNAM is the long (48 character) name given to the image.

PROGRAM SSMIRAD

Remap SSM/I Data to Radar Coordinates

FUNCTIONAL DESCRIPTION

The SSMIRAD program creates an image of SSM/I data using a radar image as a guide. The resulting image is a radar image containing SSM/I data co-located with the radar data. The remapping is made to either the Cartesian or the earth coordinate system as specified in the accompanying radar image. Note that data in the earth coordinate system can be remapped to GOES satellite coordinates. The remapped image will also take on all characteristics of the accompanying radar image except for the date and time which will be the time of the SSM/I data.

The remapping is performed by determining the closest data point in the SSM/I dataset for each pixel in the radar image being created. A blocking factor can also be specified to determine how many radar image pixels will be considered as a block in finding the nearest data point. This has the effect of creating a more blocky image but it also reduces the number of transformations and searches involved in constructing the remapped image.

PROGRAM DESCRIPTION

SSMIRAD TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
DSNAM	Name of input SSM/I dataset
RADSRC	Source of input radar image to map to (IAT or DISK)
CHANNEL	SSMI channel to map to radar
DEVICE	Output device for image (IAT, DISK or BOTH)
BLOCK	Blocking factor for remapping
SHNAM	Short name for image
LNNAM	Long name for image

DISDIR is the disk-directory location of the input radar image, the input SSM/I dataset and the output SSM/I image remapped to that radar image.

DSNAM is the name of input SSM/I dataset. If this entry is

left empty or null, a list of the available datasets in the location tagged dataset directory is displayed and the desired dataset can be located and chosen.

RADSRC is the source of the radar image which will guide the SSM/I data remapping. The input radar image may either be a dynamic image on the IAT ('IAT') or it can be a disk resident image ('DISK').

CHANNEL is the channel in the SSM/I dataset to process into an image. Channels from the SSM/I instrument are currently designated in the following way,

CHANNEL:	1	2	3	4	5	6	7
SSM/I channel:	19H	19V	22V	37H	37V	85H	85V

DEVICE is the output device on which to place the remapped SSM/I image. either the image display ('IAT') or a disk file ('DISK') or both ('BOTH') may be specified.

BLOCK is the blocking factor for remapping. **BLOCK** is the number of pixels surrounding a central pixel in the radar image into which will be mapped the corresponding SSM/I data for that central pixel. As an example, if **BLOCK** is set to '1', a 3 by 3 box of pixels in the radar image will have one SSM/I data sample mapped into that box. The central point in the box will be used to determine the SSM/I sample to be remapped. With a **BLOCK** of 1, only one ninth the amount of coordinate transforms will be needed to do the remapping. The resolution of SSM/I data is typically much lower than that of radar data so the use of blocking will not degrade the accuracy of the data but will speed up the creation of an image. If the radar data has a cell size of 1 km and high resolution 85 GHz data is being remapped (12.5 km resolution), a blocking factor of 5 or 6 is not unreasonable.

SHNAM is the short (8 character) name given to the image.

LNNAM is the long (48 character) name given to the image.

PROGRAM SWENTZ

Convert Wentz Format SSM/I Tape to a Dataset

FUNCTIONAL DESCRIPTION

The SWENTZ program converts a Wentz format SSM/I tape into a latitude, longitude tagged dataset of SSM/I data. At the time of creation, Level I corrections can be made to the data to correct for feedhorn spillover loss and cross-polarization coupling. A dataset of the SSM/I data is made and cataloged on AOIPS.

PROGRAM DESCRIPTION

SWENTZ TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk-directory location of files
TAPEDRV	Input tape drive name
LEV1FIL	Level I correction file name

DISDIR is the disk-directory location of the input level I correction file and the output SSM/I dataset.

TAPEDRV is the name of the input tape drive on which the Wentz tape is mounted. The program will take care of logically mounting the tape.

LEV1FIL is the name of the file containing the level I corrections to the SSM/I data.

Create an SSM/I Dataset from Tape DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
FILENO	Input file # to use
STARTIME	Start time to process (MMDD, HHMMSS)
ENDTIME	End time to process
SHNAM	Short name for dataset
LNNAM	Long name for dataset

FILENO is the number of the SSM/I file to process on the Wentz tape. This excludes the first, header file which is not really a data file.

STARTIME is the start of the time range of the SSM/I data to extract from the Wentz tape. Enter both the month, day (MMDD) and the hour, minute, second (HHMMSS) at which to start.

ENDTIME is the end of the time range of the SSM/I data to extract from the Wentz tape. Enter both the month, day (MMDD) and the hour, minute, second (HHMMSS) at which to end.

SHNAM is the short (8 character) name given to the SSM/I dataset.

LNNAM is the long (48 character) name given to the SSM/I dataset.

The SWZDYN dynamic tutor, a part of the SWENTZ process, handles the specific inputs needed to convert a range of times on a Wentz tape into a SSM/I LTD dataset.

CHAPTER 3

RADAR DATA PROCESSING

3.1 Radar Archive Ingest Programs

PROGRAM TPHRD

Ingest Radar Data from a NOAA/HRD Tape

FUNCTIONAL DESCRIPTION

The TPHRD program ingests radar data from a NOAA/HRD format tape. It is expected that the NOAA/HRD tape be a 9-track 1600 BPI tape with 1928 8-bit bytes per physical record and 4 beams/headers per record. Each beam is assumed to have 450 bins. It is also assumed that there is only one file per tape, containing reflectivity data only.

PROGRAM DESCRIPTION

TPHRD TUTOR

PARAMETER	DESCRIPTION
-----	-----
TAPEDRV	Input tape drive name (MTAO: or MFAO:)
STATION	Station ID
YEAR	Year of data (YY) (.e.g., 80)
MMDD	Month and day in MMDD format (e.g., 703 for July 3)
MODE	Processing mode (Ingest or Pngest)
DATAMODE	Mode of data (One-minute or Continuous)
SETNAME	Output dataset name
DESC	Dataset description
RNGDELAY	Range delay in km
WIDTH	Width of gate in km

TAPEDRV is the name of the tape drive on which the the NOAA/HRD input tape is mounted. The valid tape drive names are "MTAO:" and "MFAO:". Do NOT issue a DCL MOUNT command; this is done automatically within the ingest software.

STATION is the known abbreviation of the radar station from which the data was collected. The station abbreviation is used to retrieve the station latitude, longitude, elevation, and location from the AOIPS2\$PARAM:STATION.RAD station information file. This file must be updated before processing a tape from an "unknown" radar station.

YEAR is the year in YY format in which the data was collected. For example, for data collected on July 3, 1980, set YEAR to the value of 80.

MMDD is the month and day in MMDD format in which the data was collected. For example, for data collected on July 3, 1980, set MMDD to the value of 703.

MODE is the mode of ingest. There are two ingest modes, "INGEST" and "PNGEST". In "INGEST" mode, specify a range of consecutive sweeps to transfer from tape to disk. In "PNGEST" (partial ingest) mode, enter up to twenty (20) sweep numbers in

ascending order.

DATAMODE indicates the mode of the input data. There are two possible modes: "ONE-MINUTE" and "CONTINUOUS". The data mode specifies the method by which new sweeps are detected during the ingest process. In "ONE-MINUTE" mode, a new sweep is detected when there is a significant time gap between beams. In "CONTINUOUS" mode, a new sweep is flagged when the azimuth angle crosses the zero degree mark.

SETNAME is the name of the new radar dataset to contain the NOAA/HRD tape data. If SETNAME is set to the blank string (" "), the radar dataset catalog is displayed in order to allow the selection of an existing dataset onto which the data will be appended.

DESC is the description of the radar dataset. It should be a descriptive string of up to 48 characters in length.

RNGDELAY is the range delay, that is, the range additive factor, in units of kilometers. The range delay is added to the range of the first gate when computing the range to any gate within the beam.

WIDTH is the width of the gate, that is, the gate spacing, in units of kilometers.

SET CALIBRATION PARAMETERS DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
NOISE	Noise level
PWRCOR	Power correction
RADCON	Radar constant
DBMCON	dBm calibration coefficient
STASWP	Starting sweep number
ENDSWP	Ending sweep number
INCREM	Sweep increment count
SWEEPS	Sweep numbers to process

NOISE is a grey level value between 0 and 255 below which data is considered to be in the noise range.

PWRCOR is a power correction constant used when converting reflectivity count to grey value.

RADCON is a radar constant used when correcting for range.

DMBCON is a dBM calibration coefficient used when converting reflectivity count to grey value.

STASWP is the starting sweep number in the range of sweeps to ingest. Sweeps are numbered on the tape beginning at one (1).

ENDSWP is the ending sweep number in the range of sweeps to ingest. Sweeps are numbered on the tape beginning at one (1). Enter -1 to specify the last sweep in the file.

INCREM is the sweep increment count. A value of one (1) specifies every sweep; a value of two (2) indicates every other sweep; a value of three (3) indicates every third sweep, and so on.

SWEEPS is a list of radar sweep numbers to ingest. Enter up to twenty (20) sweep numbers in ascending order.

SET CALIBRATION PARAMATERS dynamic tutor allows the modification of NOAA/HRD radar calibration coefficients.

PROGRAM TPKSC

Kennedy Space Flight Center Tape Format Ingest

FUNCTIONAL DESCRIPTION

TPKSC stores Kennedy Space Center radar tape data to the AOIPS radar disk dataset. Multiple volumes may be ingested. Entire volumes or selected sweeps can be selected.

PROGRAM DESCRIPTION

TPKSC TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	AOIPS group name
TAPEDRV	Input tape drive name (MTAO: or MFAO:)
STVOLUME	Start volume number to ingest
EDVOLUME	End volume number to ingest

DISDIR is the AOIPS group location where the file will be stored. For example, "DATA1:[AOIPS2TST.AOIPS.RADAR]."

TAPEDRV is the tape drive name where the input tape will be processed. It can be either "MTAO" or "MFAO". The input radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the software.

STVOLUME is the start volume number on the tape that will be ingested.

EDVOLUME is the ending volume number on the tape that will be ingested.

Volume parameters for KSC tape format DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
STARTSWP	Starting sweep to ingest
ENDSWP	Ending sweep to ingest
RADFNAM	Output dataset name
DESCRIP	File description

STARTSWP is the starting sweep number to be ingested for the volume.

ENDSWP is the ending sweep number to be ingested for the volume.

RADFNAM is the name of the new radar data set to store tape data. The set name is required only if the user wants to store data in a new data set. The default will append to a selected existing data set from the radar data set catalog.

DKSCRIP is the file description for the volume being stored and is for informational purposes only.

KSCDYN dynamic tutor allows specification of volume parameters for the ingest of the Kennedy Space Center format radar data.

PROGRAM TPKSCLST

Volume list for Kennedy Space Center Tape Format

FUNCTIONAL DESCRIPTION

This program lists volume header information for a given volume from a Kennedy Space Center radar tape.

PROGRAM DESCRIPTION

TPKSCLST TUTOR

PARAMETER	DESCRIPTION
DISDIR	AOIPS group name
TAPEDRV	Input tape drive name (MTAO: or MFAO:)
STVOLUME	Start volume number to list
EDVOLUME	End volume number to list
DEVICE	Device to display volume information

DISDIR is the AOIPS group location where the list file is located. For example, "DATA1:[AOIPS2TST.AOIPS.RADAR]".

TAPEDRV is the tape drive name where the input tape will be processed. It can be either "MTAO" or "MFAO". The input radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the software.

STVOLUME is the starting volume number to list.

EDVOLUME is the ending volume number to list.

DEVICE is the location of where the volume list is displayed. It can either be the CRT screen or a file. The file is located in the DISDIR and has the name KSCLST.PRT.

PROGRAM TPMIAMI

Ingest Radar Data from WSR57 Miami Tape

FUNCTIONAL DESCRIPTION

The following capabilities are provided by this program:

- o Ingest radar data from Miami tape and then store calibrated data in a disk radar data set
- o Produce a hard-copy printout of the sweep header summary list from a WSR57 - Miami radar tape.
- o Dump radar data in decimal form at line printer.

The user will be able to select desired data sector, field types and data precision via input from TAB tutors. The tape data will be reformatted and transferred to either a new disk radar file of the specified set name, or appended to an existing disk radar file selected from the radar data set catalog.

PROGRAM DESCRIPTION

TPMIAMI TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Input tape drive name (MTAO: or MFAO:)
FILENO	File number on tape
MODE	Processing mode (ingest, pngest, list, dump)
YEAR	Year of the data
NOISE	Noise level
PWRCOR	Power correction
RADCON	Radar constant

TAPEDRV is the tape drive where the input tape will be processed. It can be either "MTAO" or "MFAO". The input radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the ingest software.

FILENO is the number of the file on tape which contains the data to be processed. In most cases, MIAMI tapes have only one file. However, some tapes apparently have

an end-of-file mark at the beginning of the tape. In this case, set FILENO to 2 to skip over the EOF mark.

MODE is defined as follows:

MODE - "INGEST"	Transfer data from tape to disk
MODE - "PNGEST"	Transfer random sweep data from tape to disk You can select up to 20 sweeps. Sweep numbers should be in ascending order.
MODE - "LIST"	Print radar sweep header list
MODE - "DUMP"	Dump radar tape data

YEAR is the year of the tape data observed.

NOISE is the threshold value below which the reflectivities are assigned to noise.

PWRCOR is used convert the reflectivity count to grey value. This power correction constant should be considered.

RADCON is used to convert range to a table.

EDIT CONTROL PARAMETERS DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
SETNAME	Output data set name
DESC	File description
STASWP	Start sweep number
ENDSWP	End sweep number
INCREM	Sweep increment count

SETNAME is the name of the new radar data set to store tape data. The set name is required only if the user wants to store data in a new data set. The default will append to a selected existing data set from the radar data set catalog.

DESC, the file description, is required only if user wants to create a new dataset or needs to update the description if it expands an existing file. The string is up to 48 characters.

STASWP is the start sweep number. It is positive.

ENDSWP is the end sweep number. It is a positive number. It should be greater than the start sweep number. Enter -1 if you process to the last sweep of the file.

INCREM is the number of sweeps to be increased to process.
If INCREM=1, it processes sweeps 1,2,3,4,5,...
If INCREM=2, it processes sweeps 1,3,5,7,9,...
If INCREM=3, it processes sweeps 1,4,7,10,13,...

User can select the sweeps to be processed

EDIT CONTROL PARAMETERS FOR PARTIAL INGEST DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
SETNAME	Output data set name
DESC	File description
SWEEPS	Sweep numbers

SETNAME is the name of the new radar data set to store tape data. The set name is required only if the user wants to store data in a new data set. Default is to append a selected existing data set from the radar data set catalog.

DESC, the file description, is required only if user wants to create a new data set or to update the description after expanding the file.

SWEEPS are the sweep numbers to be processed. They should be positive numbers in ascending order. User can specify up to twenty numbers.

User can select any sweeps to process.

OUTPUT WINDOW SPECIFICATION DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
RADAR	Radar name (Informational only)
MINR	Minimum range in km
MAXR	Maximum range in km
BEGAZ	Beginning azimuth in degree
ENDAZ	Ending azimuth in degree
BEGEL	Beginning elevation in degrees
ENDEL	Ending elevation in degrees
ANTENNA	Antenna direction

RADAR is the radar name for your reference only.
Do not edit it !!!

MINR is the minimum range of the sector, equal to or greater than the default value. This value should be less than the maximum range.

MAXR is the maximum range of the sector, equal to or less than the default value. This value should be greater than the minimum range.

BEGAZ is the beginning azimuth of the sector. Watch for the sweep direction before entering any value.

ENDAZ is the ending azimuth of the sector. Watch for the sweep direction before entering any value.

ANTENNA is the sweep direction. For PPI Scan Mode data, the valid antenna directions are CLOCKWISE and COUNTER-CLOCKWISE. For RHI Scan Mode data, the valid antenna directions are UP and DOWN. It is for your reference only. Do not edit this value !!!

OUTPUT WINDOW SPECIFICATION dynamic tutor is used for modifying the data sector.

PROGRAM TPNSSL

Ingest Radar Data from NSSL Cimarron or Norman Tape

FUNCTIONAL DESCRIPTION

Following capabilities are provided by this program:

- o Ingest radar data from an NSSL tape and then store calibrated data in a disk radar data set.
- o Produce a hard-copy printout of the sweep header summary list from an NSSL format radar tape.
- o Dump radar data in decimal form at line printer.

Data sector, field types, and data precision may be selected via input from TAE tutors. The tape data will be reformatted and transferred to either a new disk radar file of the specified set name, or appended to an existing disk radar file selected from the radar dataset catalog.

PROGRAM DESCRIPTION

TPNSSL TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Input tape drive name (MTAO: or MFAO:)
MODE	Processing mode (ingest, pngest, list, dump)
CALBFILE	Calibration file name

TAPEDRV is the tape drive where the input tape will be processed. It can be either "MTAO" or "MFAO". The input radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the ingest software.

MODE is defined as follows:

MODE - "INGEST"	Transfer data from tape to disk
MODE - "PNGEST"	Transfer random sweep data from tape to disk You can select up to 20 sweeps. Sweep numbers should be in ascending order.
MODE - "LIST"	Print radar sweep header list

MODE - "DUMP" Dump radar tape data

CALBFILE is the name of the calibration file.
An example of the required format is "CI790502".
The first 2 letters are CI for Cimarron, OK or NO for Norman, OK followed by year, month, day (yyymmdd).

SELECT DATA FIELD TYPE DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
FIELDS	Data field name RE for reflectivity VE for velocity SD for standard deviation

FIELDS is the field to process. You can select only one type of data at a time.

RE - for reflectivity data
VE - for velocity data
SD - for standard deviation data

To select the data field from the provided type

EDIT CONTROL PARAMETERS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
SETNAME	Output data set name
DESC	File description
STASWP	Start sweep number
ENDSWP	End sweep number
INCREM	Sweep increment count
THRES	Maximum spectral width

SETNAME is the name of the new radar data set to store tape data. The set name is required only if the user wants to store data in a new data set. The default will append to a selected existing data set from the radar data set catalog.

DESC, is the file description required only if user wants to create a new data set or needs to update the description if he expands an existing file. The string up to 48 characters.

STASWP is the start sweep number. It is a positive number.

ENDSWP is the end sweep number. It is a positive number.

It should be greater than start sweep number.

Enter -1 if process to the last sweep of the file.

INCREM is the number of sweeps to be increased to process.

If INCREM=1, it processes sweeps 1,2,3,4,5,...

If INCREM=2, it processes sweeps 1,3,5,7,9,...

If INCREM=3, it processes sweeps 1,4,7,10,13,...

THRES is the maximum spectral width used to eliminate noise
The default value is 15.0

User can select the sweeps to be processed

EDIT CONTROL PARAMETERS FOR PARTIAL INGEST DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
SETNAME	Output data set name
DESC	File description
THRES	Maximum spectral width
SWEEPS	Sweep numbers

SETNAME is the name of the new radar data set to store tape data. The set name is required only if the user wants to store data in a new data set. Default is to append a selected existing data set from the radar data set catalog.

DESC, the file description, is required only if user wants to create a new data set or to update the description after expanding the file.

THRES is the maximum spectral width used to eliminate noise.
The default value is 15.0.

SWEEPS are the sweep numbers to be processed.
They should be positive numbers in ascending order.
User can specify up to twenty numbers.

User can select any sweeps to process

SELECT PRECISION LEVEL DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
PRECISION	Data precision level - 1, one byte per gate - 2, two bytes per gate

PRECISION is the data precision level where a value of one (1) is entered for one byte per gate and a value of two (2) is entered for two bytes per gate.

SELECT PRECISION LEVEL dynamic tutor is used to select the precision level of the stored data values.

OUTPUT WINDOW SPECIFICATION DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
RADAR	Radar name (Informational only)
MINR	Minimum range in km
MAXR	Maximum range in km
BEGAZ	Beginning azimuth in degree
ENDAZ	Ending azimuth in degree
BEGEL	Beginning elevation in degrees
ENDEL	Ending elevation in degrees
ANTENNA	Antenna direction

RADAR is the radar name for your reference only.
Do not edit it !!!

MINR is the minimum range of the sector, equal to or greater than the default value. This value should be less than the maximum range.

MAXR is the maximum range of the sector, equal to or less than the default value. This value should be greater than the minimum range.

BEGAZ is the beginning azimuth of the sector. Watch for the sweep direction before entering any value.

ENDAZ is the ending azimuth of the sector. Watch for the sweep direction before entering any value.

ANTENNA is the sweep direction. For PPI Scan Mode data, the

valid antenna directions are CLOCKWISE and COUNTER-CLOCKWISE. For RHI Scan Mode data, the valid antenna directions are UP and DOWN. It is for your reference only. Do not edit this value !!!

OUTPUT WINDOW SPECIFICATION dynamic tutor is used for modifying the data sector.

PROGRAM TPRADAP

Process RADAP II Tape Data

FUNCTIONAL DESCRIPTION

The TPRADAP program processes archived RADAP data from a RADAP II format tape. RADAP data may be ingested into the AOIPS system, or hard-copy summary information may be generated from the tape for review. Each observation consists of 180 radials of data, each representing two (2) degrees of azimuth. However, only azimuths with non-zero data are stored on tape in a packed format. All archived data are stored as internal RADAP II category level values. In the ingest phase, the azimuth data is unpacked and converted to dBZ values. Also, zero-filled azimuths are created to fill in the azimuth gaps. The gate range for each radial is from 10 to 125 nautical miles from the radar, and is divided into one (1) nautical mile increments.

PROGRAM DESCRIPTION

TPRADAP TUTOR

PARAMETER	DESCRIPTION
-----	-----
TAPEDRV	Input tape drive name (MTAO: or MFAO:)
MODE	Processing mode (Ingest,Pngest,Dump,List)
FORMAT	Format of tape (OKL or TDL)
FILENO	File to process

TAPEDRV is the name of the tape drive on which the the RADAP II input tape is mounted. The valid tape drive names are "MTAO:" and "MFAO:". Do NOT issue a DCL MOUNT command; this is done automatically within the TPRADAP software.

MODE is the mode of processing. There are four modes: LIST, DUMP, INGEST, and PNGEST. LIST and DUMP are for listing the contents of the RADAP II tape. INGEST and PNGEST are two methods for transferring RADAP II data from tape to disk. In LIST mode, a hard copy of the RADAP II RADAR TAPE SWEEP SUMMARY LIST is generated. In DUMP mode, a hard copy RADAP II RADAR TAPE DUMP in

decimal format is generated. In INGEST mode, a range of consecutive sweeps is transferred from tape to disk. In PNGEST (partial ingest) mode, up to twenty (20) sweep numbers in ascending order are transferred.

FORMAT is the format of the RADAP II input tape. There are two formats: OKL and TDL. The OKL format is described in the RADAP II ARCHIVED DATA TAPE DESCRIPTION by R. Sladewski. The TDL format is identical to the OKL, except that there is no catalog file as the first file on the tape and the data is written to tape as unformatted data.

FILENO specifies the tape file to be processed. For an OKL format tape, this is the file pair number. For a TDL tape, this is the actual tape file number.

PROGRAM TPTOGA

Convert TOGA radar format tape to Universal tape format

FUNCTIONAL DESCRIPTION

TPTOGA is a program to convert a TOGA radar format tape to universal tape format. After conversion, this new tape can be processed by the TPUNIVER program to create an AOIPS radar dataset.

PROGRAM DESCRIPTION

TPTOGA TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEIN	Input tape drive name for TOGA tape
TAPEOUT	Output tape drive name for Universal tape
DENOUT	Tape density for Universal tape
ELVTOL	Elevation value (deg) to separate sweeps
FILENO	TOGA tape file number to begin processing
SWEEP1	Ingest sweep 1 only of each volume (YES,NO)
AZMCHK	Azimuth check for end of sweep?
AZMLIM	Azimuth for checking against for end of sweep (deg)

TAPEIN is the tape drive where the input tape will be processed. It can be either "MTAO" or "MFAO". The input radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the ingest software.

TAPEOUT is the tape drive where the output tape will be processed. It can be either "MTAO" or "MFAO". The output radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the ingest software.

DENOUT specifies the output density of the universal format tape. It can either be 1600 or 6250 BPI.

ELVTOL can be used to separate sweeps. If a beam elevation exceeds the average elevation of previous beams by ELVTOL, then a new sweep will be defined.

AZMCHK allows overriding of logic to define a new sweep when a change in scan direction is detected. If this parameter is set, then if a change of direction is detected, a new sweep is only defined if it is within about 10 degrees of AZMLIM. Thus, AZMLIM must be specified if this parameter is set.

AZMLIM is the azimuth used as a check against the software when a change of scan direction is specified.

PROGRAM TPUNMAN

Ingest Radar Data from Universal Format Tape MANUAL MODE

FUNCTIONAL DESCRIPTION

The following capabilities are provided by this program:

- o Ingest radar data from universal format tape and then store calibrated data in a disk radar data set
- o Sweeps are defined by specifying starting and ending beam numbers. Up to 16 ranges of starting and ending beam numbers can be entered for each sweep.

PROGRAM DESCRIPTION

TPUNMAN TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Input tape drive name (MTAO: or MFAO:)

TAPEDRV is the tape drive where the input tape will be processed. It can be either "MTAO" or "MFAO". The input radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the ingest software.

EDIT VOLUME PARAMETERS FOR MANUAL INGEST DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
SETNAME	Output data set name
DESC	File description
VOLSCN	Volume scan number (file number)

SETNAME is the name of the new radar data set to store tape data. The set name is required only if the user wants to store data in a new data set. The default will append to a selected existing data set from the radar data set catalog.

DESC is the file description required if the user wants to create a new data set or needs to update the description.

VOLSCN is the volume scan number to be processed.

User can select the volume to be processed.

OUTPUT RANGE WINDOW SPECIFICATION DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
RADAR	Radar name (Informational only)
MINR	Minimum range in km
MAXR	Maximum range in Km

RADAR is the radar name for your reference only.
Do NOT edit it !!!

MINR is the minimum range of the sector, equal to or greater than the default value. This value should be less than the maximum range.

MAXR is the maximum range of the sector, equal to or less than the default value. This value should be greater than the minimum range.

OUTPUT RANGE WINDOW SPECIFICATION dynamic tutor is used to modify the data sector.

OUTPUT BEAM WINDOW SPECIFICATION FOR SWEEP DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
STRBEAM	Starting beam numbers
ENDBEAM	Ending beam numbers
BMINCR	Beam increment

STRBEAM is an array of starting volume beam numbers to ingest.

ENDBEAM is an array of ending volume beam numbers corresponding to each element in the STRBEAM array.

BMINCR is the beam increment. It is used to allow skipping beams during ingest. For example, a value of two (2) means skip every other beam.

OUTPUT BEAM WINDOW SPECIFICATION FOR SWEEP dynamic tutor is used to select the desired beam ranges to ingest into a sweep.

PROGRAM TPUNIVER

Ingest Radar Data from Universal Format Tape

FUNCTIONAL DESCRIPTION

The TPUNIVER program reads a Universal Format Radar Tape. The following functions are provided:

- Transfer radar sweeps from tape to disk
- Print radar sweep header list
- Dump contents of radar tape

There are two modes of Universal ingest: INGEST and PNGEST. In INGEST mode, a range of consecutive sweeps may be transferred from tape to disk. In PNGEST (partial ingest) mode, up to twenty (20) arbitrary sweeps may be transferred.

There are two options for listing the contents of the Universal tape: LIST and DUMP. In LIST mode, a hard copy of the RADAR TAPE SWEEP SUMMARY LIST is generated. In DUMP mode, a hard copy RADAR TAPE DUMP in decimal format is generated.

PROGRAM DESCRIPTION

TPUNIVER TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Input tape drive name (MTAO: or MFAO:)
MODE	Processing mode (ingest, pngest, list, dump)

TAPEDRV is the tape drive where the input tape will be processed. It can be either "MTAO" or "MFAO". The input radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the ingest software.

MODE is defined as follows:

MODE - "INGEST" Transfer data from tape to disk

MODE - "PNGEST" Transfer random sweep data from
 tape to disk. You can select up to
 20 sweeps. Sweep numbers should
 be in ascending order.
 MODE - "LIST" Print radar sweep header list
 MODE - "DUMP" Dump radar tape data

EDIT CONTROL PARAMETERS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
SETNAME	Output data set name
DESC	File description
VOLSCN	Volume scan number (file number)
STASWP	Start sweep number
ENDSWP	End sweep number
INCREM	Sweep increment count
ELEVCHK	Elevation check for new sweep

SETNAME is the name of the new radar data set to store tape data. The set name is required only if the user wants to store data in a new data set. The default will append to a selected existing data set from the radar data set catalog.

DESC, the file description, is required only if a new data set is to be created or to modify an existing file description.

VOLSCN is the volume scan number to be processed. Enter -1 if to process all volumes.

STASWP is the start sweep number. It should be a positive number.

ENDSWP is the end sweep number. It should be a positive number. It should be greater than start sweep number. Enter -1 if process to the last sweep of the file.

INCREM is the number of sweeps to be increased to process. If INCREM=1, it processes sweeps 1,2,3,4,5,...
 If INCREM=2, it processes sweeps 1,3,5,7,9,...
 If INCREM=3, it processes sweeps 1,4,7,10,13,...

The parameter, ELEVCHK, is set to determine whether the Universal format is used alone to define a new sweep or whether an additional elevation check is used. If this parameter is set to NO, then new sweeps are defined in the

normal manner using the Universal format strictly. If this parameter is set to YES, then the elevation difference between adjacent beams is used as an additional criteria to decide whether a new sweep has been found. That is, if a new sweep is found by using the Universal format, the adjacent beams must have an elevation difference of greater than 0.25 degrees for the new sweep to be defined by the software. If the elevation angle difference is less than 0.25, then the software ingests the beam in question in the current sweep and checks the elevation of the next beam against the criteria and so on. This additional elevation check has been found to be necessary for some tapes (particularly NSSL) which incorrectly separate sweeps. NOTE: This check is only applied to the ingest mode.

EDIT CONTROL PARAMETERS dynamic tutor allows selection of the sweeps to be processed.

EDIT CONTROL PARAMETERS FOR PARTIAL INGEST DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
SETNAME	Output data set name
DESC	File description
VOLSCN	Volume scan number (file number)
SWEEPS	Sweep numbers

SETNAME is the name of the new radar data set to store tape data. The set name is required only if a new dataset is desired, otherwise the new sweeps will be appended to an existing dataset chosen from the radar dataset catalog.

DESC, the file description, is required only if a new dataset is created or to update an existing description.

VOLSCN is the volume scan number to be processed. It should be a positive number.

SWEEPS is the sweep numbers to be processed. They should be positive numbers in ascending order.

EDIT CONTROL PARAMETERS FOR PARTIAL INGEST dynamic tutor allows selection of sweeps to process.

SELECT PRECISION LEVEL DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
PRECISION	Data precision level - 1, one byte per gate - 2, two bytes per gate

PRECISION is the data precision level where a value of one (1) is entered for one byte per gate and a value of two (2) is entered for two bytes per gate.

SELECT PRECISION LEVEL dynamic tutor is used to select the precision level of the stored data values.

OUTPUT WINDOW SPECIFICATION DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
RADAR	Radar name (Informational only)
MINR	Minimum range in km
MAXR	Maximum range in km
BEGAZ	Beginning azimuth in degree
ENDAZ	Ending azimuth in degree
BEGEL	Beginning elevation in degrees
ENDEL	Ending elevation in degrees
ANTENNA	Antenna direction

RADAR is the radar name for your reference only.
Do not edit it !!!

MINR is the minimum range of the sector, equal to or greater than the default value. This value should be less than the maximum range.

MAXR is the maximum range of the sector, equal to or less than the default value. This value should be greater than the minimum range.

BEGAZ is the beginning azimuth of the sector. Watch for the sweep direction before entering any value.

ENDAZ is the ending azimuth of the sector. Watch for the sweep direction before entering any value.

ANTENNA is the sweep direction. For PPI Scan Mode data, the

valid antenna directions are CLOCKWISE and COUNTER-CLOCKWISE. For RHI Scan Mode data, the valid antenna directions are UP and DOWN. It is for your reference only. Do not edit this value !!!

OUTPUT WINDOW SPECIFICATION dynamic tutor is used for modifying the data sector.

PROGRAM TPVOLST

Volume Beam List for Universal Format Tape

FUNCTIONAL DESCRIPTION

TPVOLST lists beam information for a given volume (file) from a Universal radar tape. Beam information includes: the beam number, azimuth, elevation and time. This information is written to a disk file specified by the parameter FILENAME.

PROGRAM DESCRIPTION

TPVOLST TUTOR

PARAMETER	DESCRIPTION
DISDIR	AOIPS group name
FILENAME	File name for beam dump
TAPEDRV	Input tape drive name (MTAO: or MFAO:)
VOLUME	Volume number to dump

DISDIR is the AOIPS group location where the beam dump file will be stored. For example,
DATA1:[AOIPS2TST.AOIPS.RADAR].

FILENAME is the name of the file that receives the volume beam dump.

TAPEDRV is the tape drive where the input tape will be processed. It can be either "MTAO" or "MFAO". The input radar tape must be loaded on the specified tape drive as requested. Don't issue "MOUNT" command from any terminal. It will be done by the software.

VOLUME is the volume number (file number) of the tape to list.

3.2 ALDEN Radar Ingest Program

PROGRAM REALR

Create AOIPS Radar Images from the Alden Radar System

FUNCTIONAL DESCRIPTION

This program permits the storage of Alden radar images to disk as AOIPS images. This program must be used in conjunction with the Alden radar system. It is recommended that the Alden radar system be set up prior to execution of this program. Please refer to the manuals for how to obtain images on the Alden.

PROGRAM DESCRIPTION

REALR TUTOR

PARAMETER -----	DESCRIPTION -----
NUMIMAGS	Number of images to process this session
COMPSITE	Composite image? (YES or NO)

NUMIMAGS is the number of radar images to be processed during this session. The software will read the ALDEN Radar System port as many times as indicated by this variable.

COMPSITE is used to indicate whether or not the radar images being collected are actually the intermediate images sent by the TRC radar when producing a composite radar image. When COMPSITE is YES, only one image will be saved to disk.

NOTE: NUMIMGS must be large enough to account for the number of radar stations used to make up the composite image.

3.3 Radar Remap Programs

PROGRAM RADMAP

Generate Radar Remapping Command File

FUNCTIONAL DESCRIPTION

RADMAP provides the capability to remap radar BSCAN images to either PPI, CAPPI, or vertical section images. RADMAP remaps a radar image (BSCAN) from radial to earth or Cartesian coordinates. The area to be remapped in the BSCAN can be defined by either specifying a latitude/longitude, a range/azimuth, or by using a box on the BSCAN image. Note that the earth coordinate system is equivalent to the Modified Cylindrical Equidistant GEMPAK projection.

The RADMAP program is the first step of the two-step process to create remapped radar images from radar dataset BSCAN. RADMAP generates the parameters necessary to perform radar remapping and creates a remapping command file which stores these parameters for subsequent use by the program RDREMAP which performs the actual remapping.

These parameters include the type of remapped image, (e.g., PPI, or CAPPI), the portion of the BSCAN data to remap, the resolution of the remapped image the coordinate system to remap to, etc. Many of the remapping parameters are specified by the user. Remapped radar images may be of the type PPI, CAPPI or Vertical Section where the Vertical Section may be generated from datasets in either the PPI or RHI Scan Mode.

The sequence of displays/tutors displayed to produce a remapping command file is dependent on some of the options selected. The sequence of tutors/displays and associated explanations are presented for the two major paths through the program. Case 1 describes the program sequence for creating a command file for either a PPI or CAPPI. Case 2 describes the sequence for generating a command file for Vertical Sections (i.e., true RHI's or reconstructed "RHI's").

CASE 1: PPI and CAPPI

Select a radar dataset to remap from the RADAR DATASET CATALOG. Select a sweep from the dataset RADAR SWEEP SUMMARY LIST. This sweep will be used as a basis for selecting the area to remap. Select a field to remap from the fields stored in the dataset from the FIELD SELECTION DYNAMIC TUTOR.

The next set of tutors/displays invoked is dependent on the area definition parameter, MODE, selected.

If the MODE is BSCAN then the user will be prompted to drop a BSCAN image. After the image is displayed, a graphics box will appear and control will shift to the trackball. Shape and move the graphics box on the image using the trackball to define the area of interest to remap. Accept the area defined by the box for remapping by pressing the DEFINE button of the button board.

If the MODE for defining the remapping area is LAT/LON the user will be prompted to specify the starting and ending latitude and longitude to define the remapping region.

If the MODE for defining the remapping area is RNG/AZM, the user will be prompted to specify the starting and ending range and azimuths to define the remapping region.

For the case in which the remapping category is CAPPI, the following two additional inputs must be specified.

- 1) Model for refraction
 - a) exponential
or
 - b) 4/3 earth radius
- 2) Altitudes to remap
 - a) constant increments starting at a user specified height
or
 - b) arbitrary user specified heights

Once all of this information is specified, a display will appear which shows the resulting data window boundaries. The size of the output image can be adjusted by changing the CELL SIZE parameter. CELL SIZE is the size in kilometers of a single pixel on the display screen. The output image will shrink if the CELL SIZE is increased and vice-versa. A minimum value exists for which the output image fills the entire screen.

After CELL SIZE is chosen the user will be prompted to supply an image description. It is also possible at this time to specify the desire to convert reflectivities to rain rate (if applicable) using a user specified Z-R relation.

CASE 2: VERTICAL SECTION

Specify VERT for the variable CATEGORY. Select a radar dataset to remap from the RADAR DATASET CATALOG and a dataset field. Depending on the type of dataset chosen, there are two major paths to follow. The first case is the one in which the radar dataset is composed of data collected in the RHI mode, i.e., when the antenna is stepped up and/or down in elevation. This is the most straightforward path of

the two. The second case is the one in which the radar dataset is composed of data collected in the PPI mode, i.e., when the antenna is stepped clockwise or counter-clockwise in azimuth. In this case the user may reconstruct a "pseudo RHI" in any orientation desired given a volume scan of PPI sweeps. Interpolation in the vertical between discrete elevation sweeps is performed.

In both cases the program will prompt to specify the model for refraction as in the case of the CAPPI remapping in the previous section. The path that is followed after this is determined by the type of radar dataset chosen.

VERTICAL SECTION PATH A (true RHI mode):

- 1) specify the minimum and maximum range to remap
- 2) specify if you desire the range to increase to the right or the left in the output image
- 3) specify the minimum and maximum altitude to remap (in km MSL)
- 4) adjust the horizontal and vertical CELL SIZES to produce the desired image size.
- 5) specify an image description

VERTICAL SECTION PATH B (pseudo RHI mode):

If the dataset is in the PPI scan mode the user must specify the mode to define the cross-section to be remapped. Two mode types are available: 1) Direct Entry mode, and 2) Interactive Image mode. The former mode is chosen when the range/azimuths or latitude/longitudes of the endpoints of the vertical section are known. The latter mode is chosen when the user does not know this information a priori and wishes to choose the endpoints "interactively" by using a previously remapped PPI or CAPPI image from the chosen dataset (which has been dropped to the image analysis terminal prior to executing this program).

If the Direct Entry mode is desired, one of four options for endpoint input are available:

1. LATITUDE, LONGITUDE (DEFAULT)
2. DISTANCE, AZIMUTH FROM RADAR STATION (KM, DEG)
3. DISTANCE X,Y FROM RADAR STATION (KM)
4. TV COORDINATES (PIXEL, LINE)

Specify the end point coordinates when prompted. A summary of this input information will be presented. Review the information concerning the location of the end points, as well as the cross-section orientation and the distance between end points. The user may then accept or reject the defined cross-section.

If the Interactive Image mode is desired the user must select a refresh memory on the image analysis terminal containing the remapped PPI or CAPPI image to be used in

defining the cross-section. This mode allows the cross-section to be defined by a cursor. Define the cross-section endpoints using the trackball and the DEFINE button of the button board. The resulting cross-section is shown as a line on a graphics plane superimposed on the CAPPI/PPI image. Subsequently, the cross-section size and orientation may be altered interactively. The following options are available:

1. CHANGE LENGTH WITH MID-POINT FIXED
2. CHANGE ORIENTATION WITH MID-POINT FIXED
3. USE TRACKBALL TO SHRINK, STRETCH, OR TRANSLATE

Specify whether to alter the cross-section size or orientation or if the trackball should be used to shrink, stretch or translate the cross-section, or whether to accept or reject the current cross-section. If the trackball option is selected, then control goes to the trackball and function buttons as defined in the ALTER CROSS-SECTION BUTTON MENU see PROGRAM DESCRIPTION.

PROGRAM DESCRIPTION

RADMAP TUTOR

PARAMETER	DESCRIPTION
CATEGORY	Remap Category (PPI, VERT, CAPPI NOTE: VERT - VERTICAL SECTION)
TYPE	Remap Type (R2EARTH, R2CARTESIAN)
MODE	Area Definition Mode Note: PPI and CAPPI only (BSCAN, LAT/LON, RNG/AZM)
METHOD	Interpolation Method (BILINEAR)
INGROUP	Image Directory Location

CATEGORY is the type of remapped radar image the user desires. Currently, PPI (Plan Position Indicator), CAPPI (Constant Altitude PPI), and VERT (vertical section, i.e., range/height section). Note: The MODE parameter is not applicable to CATEGORY VERT and is ignored in that case.

TYPE is the coordinate system type for the remapped image. The two valid types are the earth (R2EARTH) and Cartesian (X,Y) coordinate systems.

MODE is the method used to define an area of the radar

dataset to remap. Note that this parameter only applies to the PPI and CAPPI categories. Three valid methods are available:

- 1) BSCAN where the cursor is used to define a box on a radar dataset BSCAN. Thus the radar dataset B-Scan is used as a guide for determining which area to remap;
- 2) LAT/LON where the latitude/longitude area (window) is explicitly entered;
- 3) RNG/AZM where a range/azimuth window is used to define the area to remap.

METHOD determines which interpolation technique will be used for remapping. Currently, only BILINEAR is valid.

SELECT AREA TO REMAP DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
BACK	Back up one menu level
FIELDS	Fields in sweep (Informational)
SELECT	Select field of interest
RNGSTART	Starting gate range (km)
RNGEND	Ending gate range (km)
AZSTART	Starting azimuth angle (deg.)
AZEND	Ending azimuth angle (deg.)
ANTENNA	Antenna direction (Informational)

BACK is a control parameter. If you set BACK = "YES", control will return to the previous menu within the process.

FIELDS specifies all the data fields contained in the sweep. This parameter is purely informational in nature.

Assign to SELECT the name of the data field you want to display. You should enter one of the two character names specified by FIELDS.

RNGSTART is the starting gate range in units of KM. RNGSTART must be greater than or equal to the minimum range for the selected sweep.

RNGEND is the ending gate range in units of KM. RNGEND must be less than or equal to the maximum range for the selected sweep.

AZSTART is the starting azimuth angle in degrees. AZSTART must be greater than or equal to the minimum azimuth angle for the selected sweep.

AZEND is the ending azimuth angle in degrees. AZEND must be less than or equal to the maximum azimuth angle for the selected sweep.

ANTENNA is the antenna rotation direction : "Clockwise" or "Counter-clockwise". This parameter is purely informational in nature.

THE SELECT AREA TO REMAP tutor allows the specification the area to be remapped by editing:

- a. Starting and ending gate range
- b. Starting and ending azimuth angle

The following set of tutors and displays are presented by RADMAP. The sequence of these displays is dependent on the options (e.g., remapping category, area definition mode) selected.

BSCAN IMAGE START/END RANGE
START/END AZIMUTH
RADAR STATION LATITUDE/LONGITUDE

BOX CENTER PIXEL/LINE POSITION
GATE/BEAM NUMBER
RANGE/AZIMUTH
LATITUDE
LONGITUDE
BOX MINIMUM/MAXIMUM LATITUDE
BOX MINIMUM/MAXIMUM LONGITUDE

BOX COORDINATE PARAMETER DISPLAY

If the MODE for defining the remapping area is BSCAN, the BOX COORDINATE PARAMETER DISPLAY is presented after the box has been defined on a BSCAN for defining the remap area. This display allows the review box coordinate information. Note that ranges are given in kilometers, azimuths in degrees and latitude and longitude in degrees, minutes, seconds (ddmmss).

SWEEP NUMBER -
RADAR TYPE -
RADAR STATION ID -
SWEEP START TIME - DATE: TIME:
SWEEP START/END LATITUDE TO
SWEEP START/END LATITUDE TO

PLEASE SPECIFY REMAP WINDOW IN LATITUDE AND LONGITUDE
(1) START LATITUDE (DDMMSS)
(2) END LATITUDE (DDMMSS)
(3) START LONGITUDE (DDMMSS)
(4) END LONGITUDE (DDMMSS)
(5) PROCESS MODCE (1 - YES, 2 - NO)

LAT/LON DEFINITION PARAMETER DISPLAY

If the MODE for defining the remapping area is LAT/LON then the LAT/LON DEFINITION PARAMETER DISPLAY is presented. Specify the starting and ending latitude and longitude to define the remapping region.

PLEASE ENTER REFRACTION MODEL TO BE USED (DEFAULT - 2)
- 1 EXPONENTIAL; REFRACTIVE INDEX = $1 + \text{CONST} * \text{EXP}(-\text{CONST} * \text{HEIGHT})$
- 2 $4/3$ EARTH RADIUS

TO PROCEED PRESS RETURN, TO EXIT ENTER - 1

MODEL FOR REFRACTION PARAMETER DISPLAY

Specify the model of refraction to be used in the remapping calculations. Two models are valid: 1) the exponential model, and 2) the $4/3$ earth radius approximation.

** ENTER CONSTANTS TO BE USED WITH THE MODEL **

REFRACTIVE INDEX = $1 + A * 1.06 * \text{EXP}(-B * Z)$

1) CONSTANT A (DEFAULT - 340.0)
2) CONSTANT B (DEFAULT - 0.14)

TO PROCEED PRESS RETURN, TO EXIT ENTER -1

EXPONENTIAL REFRACTION PARAMETER DISPLAY

The EXPONENTIAL REFRACTION PARAMETER DISPLAY specifies the constants to be used in the model of refraction.

PLEASE ENTER CAPPI HEIGHT SELECTION MODE (DEFAULT = 1)
- 1 CONSTANT INCREMENTS STARTING AT USER SPECIFIED HEIGHT
- 2 USER SPECIFIED HEIGHTS

TO PROCEED PRESS RETURN, TO EXIT ENTER -1

MODE FOR SELECTION OF CAPPI LEVELS PARAMETER DISPLAY

The above display specifies the manner to select heights for the CAPPI levels. CAPPI heights may be entered using two different modes: 1) constant increments starting at some initial height; and 2), user-specified heights at any increment.

**** CAPPI HEIGHT SELECTION ****

- 1) STARTING HEIGHT FOR CAPPI ANALYSIS
(SHOULD BE BETWEEN AND KM)
- 2) ENTER INCREMENT TO CAPPI HEIGHT (KM)
- 3) ENTER NUMBER OF INCREMENTS (LESS THAN 10)

PLEASE ENTER ITEM NUMBER AND VALUE
TO PROCEED PRESS RETURN, TO EXIT ENTER -1

CAPPI INCREMENT HEIGHT PARAMETER DISPLAY

**** CAPPI HEIGHT SELECTION ****

ENTER UP TO 10 DESIRED CAPPI HEIGHTS
BETWEEN AND .

TO EXIT ENTER - 1

CAPPI HEIGHT PARAMETER DISPLAY

Once the mode is selected, specify the heights according to the CAPPI INCREMENT HEIGHT PARAMETER DISPLAY or the CAPPI HEIGHT PARAMETER DISPLAY.

INPUT DATA WINDOW

START/END GATE RANGE (KM)
START/END AZIMUTH ANGLE (DEG)
NOMINAL ELEVATION ANGLE (DEG)
STATION LATITUDE/LONGITUDE

OUTPUT DATA WINDOW

START/END LATITUDE START/END LONGITUDE
NO. OF PIXELS/LINES

- (1) STATION PIXEL NO. (2) STATION LINE NO.
(3) CELL SIZE (KM)
(4) PROCESS MODE (- 0 REDEFINE AREA)
(- 1 GENERATE COMMAND)
(- 2 EXIT)

OUTPUT/INPUT GRID DENSITY RATIO AT START GATE
OUTPUT/INPUT GRID DENSITY RATIO AT END GATE

TO CHANGE VALUE, ENTER ITEM NUMBER AND NEW VALUE
OR PRESS RETURN TO CONTINUE.

REMAP WINDOW PARAMETER DISPLAY

The above display provides the capability to review information concerning both the input and output windows, the BSCAN and PPI/CAPPI respectively. Alter the size and resolution of the output image if desired by changing the cell size. If this parameter is altered, RADMAP adjusts the other output window parameters appropriately.

*** RADAR REMAP (VERTICAL PLANE) ***

ENTER PPI OR CAPPI IMAGE FILE #
ENTER 0 IF PPI IMAGE UNAVAILABLE
-1 TO EXAMINE REFRESH IMAGE LIST
E TO EXIT

CROSS-SECTION DEFINITION PARAMETER DISPLAY

The above display is presented to specify the mode to define the cross-section to be remapped. Two mode types are available:

- 1) Direct Entry mode, and 2) CAPPI/PPI mode.

To select the direct entry mode, enter 0. This mode allows cross-section definition from the keyboard only, without the use of an input image.

To select the CAPPI/PPI mode, enter a PPI or CAPPI image file number or enter -1 to select an unlocked refresh memory from the IMAGE SELECTION LIST. This mode, which uses a CAPPI or PPI image as guidance in defining the cross-section, allows the the cross- section to be defined

by either a cursor or by direct entry. The cross-section is shown as a line in graphics superimposed on the CAPPI/PPI image. Subsequently, the cross-section size and orientation may be altered interactively.

DEFINING CROSS-SECTION BY DIRECT ENTRY

1. LATITUDE, LONGITUDE (DEFAULT)
2. DISTANCE, AZIMUTH FROM RADAR STATION (KM, DEG)
3. DISTANCE X,Y FROM RADAR STATION (KM)
4. EXIT

ENTER ITEM NUMBER

CROSS-SECTION DIRECT ENTRY PARAMETER DISPLAY

Select whether cross-section end point coordinates will be defined as latitude/ longitude, distance/azimuth from radar station, or as Cartesian distance (x,y) from the radar station. Then, specify the end point coordinates when prompted.

THE COORDINATES OF THE TWO END POINTS USED TO DEFINE THE PLANE ARE AS FOLLOWS

LATITUDE/LONGITUDE OF POINT 1:
LATITUDE/LONGITUDE OF POINT 2:
DISTANCE/AZIMUTH OF POINT 1:
DISTANCE/AZIMUTH OF POINT 2:
X,Y DISTANCE FORM RADAR STATION
OF POINT 1:
X,Y DISTANCE FORM RADAR STATION
OF POINT 2:
ORIENTATION OF PLANE
(CCW FROM X-AXIS)
DISTANCE BETWEEN THE TWO POINTS

1. CHANGE LENGTH WITH MID-POINT FIXED
2. CHANGE ORIENTATION WITH MID-POINT FIXED
3. USE TRACKBALL TO SHRINK, STRETCH, OR TRANSLATE
4. ACCEPT CURRENT VALUES (DEFAULT)
5. REJECT

END POINTS COORDINATES PARAMETER DISPLAY

Review the information concerning the location of the end points, as well as the cross-section orientation and the distance between end points. Accept or reject the defined cross-section or alter the length or orientation of the cross-section. If the size or orientation is changed, the cross-section end point coordinates are updated

appropriately.

ENTER RHI DIRECT ENTRY OPTION FOR REMAPPING
VERTICAL SECTION:

ENTER DISTANCE FROM RADAR FOR EACH END POINT IN KM
(RADAR DATA SET MIN AND MAX RANGES IN KM ARE:)
OR ENTER E TO EXIT ROUTINE

RHI DIRECT ENTRY PARAMETER DISPLAY

Specify the distance from the radar for each cross-section
end point. The dataset minimum and maximum ranges are
provided for guidance.

	A	B	C	D	F
3	SHRINK POINT 1			SHRINK POINT 2	EXIT
2	TRANSLATE HORIZ'LY TO LEFT	TRANSLATE VERT'LY UPWARD	TRANSLATE VERT'LY DOWNWARD	TRANSLATE HORIZ'LY TO RIGHT	INCREASE DELTA
1	STRETCH PT 1			STRETCH PT 2	DECREASE DELTA

ALTER CROSS-SECTION BUTTON MENU

Shrink Point 1 or 2

Shrinks cross-section line on image from that end point
towards the other each time it is pressed.

Translate Horizontally To Left or Right

Translates the cross-section line horizontally to the left
or right each time it is pressed.

Translate Vertically Upward or Downward

Translates the cross-section line vertically upward or
downward each time it is pressed.

Increase or Decrease Delta

This increases or decreases the increment of movements or
size change for shrink, stretch or translate functions.

Exit

Returns control to CRT keyboard.

LAT/LON OF POINT 1:(,)
LAT/LON OF POINT 2:(,)
ENTER 1 OR 2 TO INDICATE IF
POINT 1 OR 2 SHOULD BE THE LEFT OF THE IMAGE

CROSS-SECTION ORIENTATION PARAMETER DISPLAY

Specify which cross-section end point will appear on the left-hand side of the output cross-section image. The latitude and longitude for each end point is provided for guidance.

THE WIDTH OF THE PLANE IS (KM)
(MINIMUM AND MAXIMUM HEIGHT IN DATA ARE
(KM)
DEFAULT START/END HEIGHT ARE
(KM)

PLEASE ENTER START/END HEIGHT
(> MIN AND < MAX HEIGHT)
OR PRESS RETURN TO CONTINUE

CROSS-SECTION HEIGHT PARAMETER DISPLAY

Specify the minimum and maximum height of the cross-section. The dataset minimum and maximum heights are provided as defaults for guidance.

INPUT DATA WINDOW

LATITUDE/LONGITUDE OF LEFT EDGE:

LATITUDE/LONGITUDE OF CENTER:

LATITUDE/LONGITUDE OF RIGHT EDGE:

WIDTH OF PLANE (KM) START/CENTER/END HEIGHT(KM)

OUTPUT DATA WINDOW

START/CENTER/END PIXEL: START/CENTER/END LINE:

NO. OF PIXELS/LINES:

1. HORIZONTAL CELL SIZE -

2. VERTICAL CELL SIZE -

3. PIXEL # OF CENTER OF REMAP AREA

4. LINE # OF CENTER OF REMAP AREA

5. PROCESS MODE (-0 REDEFINE) (-1 GENERATE) (-2 EXIT)

OUTPUT/INPUT GRID DENSITY AT CLOSEST PT

OUTPUT/INPUT GRID DENSITY AT FURTHEST PT

TO CHANGE VALUE, ENTER ITEM NUMBER AND NEW VALUE

OR PRESS RETURN TO CONTINUE

VERTICAL SECTION WINDOW PARAMETER DISPLAY

Review information concerning both the input and output window, the BSCAN and VERTICAL SECTION respectively. Alter the location of the radar station and output image resolution if desired. Changing the output image resolution will alter the output image size.

REMAPPED IMAGE DESCRIPTION DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
IMGDES	Image Description for Directory File
ANNO	Annotation (Yes or No)
RAINFALL	Output in rainfall rate? (Yes or No)
COEFF	Coefficient for Conversion
EXPON	Exponent for Conversion

IMGDES is the image description which will be entered into the image directory file. The maximum number of characters allowed in the description is forty-eight.

ANNO is a flag for whether or not annotation is desired on the remapped image.

RAINFALL is a flag for whether the reflectivity image is to be converted to rainfall rate (mm/hour) during the remapping process.

COEFF is the coefficient satisfying the equation :

$$Z = \text{COEFF} * \text{rainfall_rate} ** \text{EXPON}$$

where Z is in units of mm^6/m^3 .

EXPON is the exponent satisfying the equation :

$$Z = \text{COEFF} * \text{rainfall_rate} ** \text{EXPON}$$

where Z is in units of mm^6/m^3 .

The REMAPPED IMAGE DESCRIPTION dynamic tutor prompts for the following information:

1. a description of the image to be remapped
2. whether or not you want annotation on the remapped image
3. if a reflectivity image, whether or not you want your output image in rate of rainfall (mm/hour)
4. if a rainfall rate image is desired, the values of the constants used in the conversion equation.

PROGRAM RADSAT

Radar to Satellite Remapping Function

FUNCTIONAL DESCRIPTION

RADSAT remaps PPI or CAPPI images in the earth coordinate system to a GOES satellite projection image. Either a portion or the entire radar image may be remapped at a user-specified cloud height. An AOIPS satellite image with a navigation link must be selected as a basis for the remapping.

- o Specify the AOIPS2 file location of the satellite image to be used as a basis for the remapping. Note that the satellite image must be linked to the appropriate AOIPS navigation files for RADSAT to work properly.

- o Select a radar image to remap from the IMAGE SELECTION LIST.

- o Specify the portion of the radar image to remap from the RADSAT AREA DEFINITION DISPLAY. The area may be selected by specifying a line and pixel window in image coordinates, or by defining an area with the button board. Alternatively, the entire radar image may be selected.

- o If the button option is specified, then control goes to the trackball and button functions shown in the RADSAT AREA DEFINITION BUTTON MENU. A box, which can be shaped or moved, is used to define an area on the radar image.

- o Specify that grid lines for interpolation are to be superimposed on the image by entering 'Y'. The default is 'NO'.

- o Select the satellite image to be used as a basis for the remapping from the IMAGE SELECTION LIST.

- o Specify the grid spacing (NGRID) used in the interpolation algorithm for remapping. The default of 20 should be acceptable for most radar images.

- o Specify the cloud height at which the radar image is to be remapped.

- o Select a refresh memory for the remapped radar image from the IMAGE SELECTION LIST. The remapped radar image may be written over the satellite image used to generate it.

PROGRAM DESCRIPTION

RADSAT TUTOR

PARAMETER -----	DESCRIPTION -----
RDISDIR	Radar Image Disk/Directory
SDISDIR	Satellite Image Disk/Directory

RDISDIR is the name of the disk/directory where the radar image to be remapped is located.

SDISDIR is the name of the disk/directory where the satellite image to be remapped is located.

The following IIS button menu appears if a box to define the area to remap has been specified.

	A	B	C	D	F
3					Exit
2		Move	Shape		
1					Define

RADSAT AREA DEFINITION BUTTON MENU

1F: Define

Defines the area to be remapped by the box drawn on the image and exits the IIS button board

2B: Move

Moves the box to the desired area to remap

2C: Shape

Shapes the box to the desired area to remap

3F: Exit

Exits the IIS button board without defining the box

PROGRAM RDREMAP

Remap Radar Image

FUNCTIONAL DESCRIPTION

The RDREMAP program is the second step of the two-step process to create remapped radar images from radar dataset B-Scans. RDREMAP performs the actual remapping by using the instructions stored in the remapping command file generated by RADMAP. Remapped images of PPI, CAPPI, or Vertical Section type may be produced in the earth or Cartesian coordinate system.

In order for RDREMAP to find the remapping command file, the AOIPTS2 file location must be set appropriately. In addition, the radar dataset must be in the same location as the remapping command file.

PROGRAM DESCRIPTION

RDREMAP TUTOR

PARAMETER -----	DESCRIPTION -----
MAPALL	Remap flag for values greater than 100

MAPALL is a flag to remap values above 100 thru 219 for fields under the reflectivity category. Normally, deleted or bad values are assigned to values above 100. Thus, these values are not remapped. However under special situations, for user derived fields such as hail quantity, the values for these fields have been scaled to values above 100. Only for those situations should MAPALL be set to "YES".

3.4 Radar Analysis Programs

PROGRAM BSCAN

Display BSCAN Image

FUNCTIONAL DESCRIPTION

The BSCAN program produces an azimuth or elevation versus range B-Scan of a radar sweep from the radar dataset for the purpose of determining data quality and echo locations. The BSCAN display may be directed to either the image analysis terminal or a printer.

Select an output device by setting DEVICE to IAT or PRINTER. Select the radar sweep to be displayed by specifying SETNAME, FIELDTYP, and SWEEPNUM.

Select an area of the radar sweep to display. For PPI Scan Mode data, enter the range/azimuth output window. GATESKIP is the gate skip factor. The unit of measurement is in number of gates. A value of "1" means every gate is displayed; a value of "2" means every other gate is displayed, and so on. Similarly, AZMSKIP is the azimuth skip factor in number of beams. See the the RADAR PROGRAM PARAMETERS section for a description of the other parameters.

If the radar data is in RHI Scan Mode, a range/elevation window is displayed. In that case, the starting elevation angle in degrees, ELSTART, the ending elevation angle, ELEND, and the elevation skip factor, ELMSKIP, replace AZSTART, AZEND, and AZMSKIP, respectively.

For a dynamic BSCAN image, select an unlocked refresh memory from the IMAGE SELECTION LIST. The LUT CATALOG is displayed for selection of primary and secondary look-up tables. After the dynamic BSCAN image is created, select another sweep from the RADAR SWEEP SUMMARY LIST or exit the program.

For a BSCAN printout, specify the LUT parameters :

- a. data thresholds (low and high) for the LUT
- b. number of intervals between the thresholds
- c. interval definition
 1. range automatically divided into equal segments and interval symbols assigned sequential values (0-9, A-Z)
 2. user-specified intervals and/or symbols

Once a look-up table is set up for a BSCAN print-out, the user is prompted to accept it, as shown in the

BSCAN LUT figure. After the BSCAN print-out is generated, select another sweep from the RADAR SWEEP SUMMARY LIST or exit the program.

PROGRAM DESCRIPTION

BSCAN TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Location of data set
DEVICE	Output device (IAT or PRINTER)
SETNAME	RADAR data set name
SWEEPNUM	Sweep number
FIELDTYP	Field type

INGROUP specifies the location (disk and directory) of the radar data set.

OUTDEV is the device on which the BSCAN output is displayed. The available devices are the image analysis terminal ("IAT") and the line printer ("PRINTER"). The actual printed output goes to the printer specified by the AOIPS/2 printer device name variable F\$PRINT which can be changed by program PRINTER.

SETNAME specifies the RADAR data set you want to work with. If you accept the default value (SETNAME = " "), you may select a data set from the RADAR data set catalog.

SWEEPNUM is the RADAR sweep number you want to display. If you accept the default value (SWEEPNUM = 0), you will be asked to select a sweep from the RADAR sweep summary list.

FIELDTYP is the RADAR field type you want to display. If you accept the default value (FIELDTYP = " "), you must select a field type from a list of the fields contained in the data set.

Some valid field types are:

VE	Velocity
DZ	Reflectivity
VF	Folded Velocity

DISPLAY BSCAN IMAGE DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
LOW	Low LUT threshold
HIGH	High LUT threshold
NUMINT	Number of intervals (<= 20)
INTVLDEF	Interval definition (Automatic, User-specified)
RNGSTART	Starting gate range (km)
RNGEND	Ending gate range (km)
GATESKIP	Gate skip factor (gates)
AZSTART	Starting azimuth angle (deg.)
AZEND	Ending azimuth angle (deg.)
AZMSKIP	Azimuth skip factor (beams)
ELSTART	Starting elevation angle (deg.)
ELEND	Ending elevation angle (deg.)
ELMSKIP	Elevation skip factor (beams)
ANTENNA	Antenna direction (Informational)
FIELDS	Fields in sweep (Informational)
SELECT	Select field of interest
INV	Intervals between thresholds
SYMBOL	Symbols for intervals
MISSING	Symbol for missing data values
BADDATA	Symbol for bad data values
LOWSYMBL	Symbol for valid data below low LUT threshold
HIGHSYMB	Symbol for valid data above high LUT threshold
BACK	Back up one menu level

LOW is the lower threshold of the LUT used to generate a BSCAN printout. LOW must be within the valid data range for the selected field. If it is outside of this range, it is set to the lowest valid data value.

The valid data ranges are as follows :

8-bit Reflectivity (unsigned)	236-255,0-80
16-bit Reflectivity (signed)	-20 - 80
16-bit Velocity (signed)	-100 - 100

HIGH is the upper threshold of the LUT used to generate a BSCAN printout. HIGH must be within the valid data range for the selected field. If it is outside of this range, it is set to the highest valid data value.

The valid data ranges are as follows :

8-bit Reflectivity (unsigned)	236-255,0-80
16-bit Reflectivity (signed)	-20 - 80
16-bit Velocity (signed)	-100 - 100

NUMINT is the number of intervals in the LUT between the upper and lower thresholds. NUMINT may not exceed 20.

INTVLDEF specifies the manner in which the intervals and symbols are determined :

A. "AUTOMATIC" -- the intervals are determined internally by dividing the entire LUT range into equal segments and the corresponding symbols are assigned sequential values : 0-9, A-Z.

B. "USER-SPECIFIED" -- you may edit the LUT break points to specify the intervals and/or you may edit the symbols corresponding to the intervals.

RNGSTART is the starting gate range in units of KM. RNGSTART must be greater than or equal to the minimum range for the selected sweep.

RNGEND is the ending gate range in units of KM. RNGEND must be less than or equal to the maximum range for the selected sweep.

GATESKIP is the gate skip factor in number of gates.

AZSTART is the starting azimuth angle in degrees. AZSTART must be greater than or equal to the minimum azimuth angle for the selected sweep.

AZEND is the ending azimuth angle in degrees. AZEND must be less than or equal to the maximum azimuth angle for the selected sweep.

AZMSKIP is the azimuth skip factor in number of beams.

ELSTART is the starting elevation angle in degrees. ELSTART must be greater than or equal to the minimum elevation angle for the selected sweep.

ELEND is the ending elevation angle in degrees. ELEND must be less than or equal to the maximum elevation angle for the selected sweep.

ELMSKIP is the elevation skip factor in number of beams.

ANTENNA is the antenna rotation direction : "Clockwise" or "Counter-clockwise". This parameter is purely informational in nature.

FIELDS specifies all the data fields contained in the sweep. This parameter is purely informational in nature.

SELECT is the name of the data field you want to display. You should enter one of the two character names specified by **FIELDS**.

INV is an array of the LUT breakpoints between the upper and lower thresholds. The default values are the breakpoints determined by dividing the entire LUT range into equal segments. **INV** must contain (**NUMINT** - 1) breakpoints.

SYMBOL is an array of symbols corresponding to each interval. The default is sequentially assigned symbols. **SYMBOL** must contain (**NUMINT** - 1) symbols.

MISSING is the symbol that identifies missing radar data values. You may assign any valid one-character string constant to **MISSING**.

BADDATA is the symbol that identifies a radar data return flagged as "deleted". You may assign any valid one-character string constant to **BADDATA**.

LOWSYMBL is the symbol that identifies a data value within the valid radar data range but below the lower threshold of the LUT. You may assign any valid one-character string constant to **LOWSYMBL**.

HIGHSYMB is the symbol that identifies a data value within the valid radar data range but above the upper threshold of the LUT. You may assign any valid one-character string constant to **HIGHSYMB**.

BACK is a control parameter. If you set **BACK** = "YES", control will return to the previous menu within the process.

The **DISPLAY BSCAN** dynamic tutor allows the specification of radar parameters for the display of radar bscans.

PROGRAM RDEDIT

Edit Radar Data

FUNCTIONAL DESCRIPTION

RDEDIT allows interactive editing of the RADAR data set through the image analysis terminal. The editing functions are :

- o Delete reflectivity/velocity data
- o Undelete reflectivity/velocity data
- o Unfold velocity data
- o Absolute velocity unfolding
- o Relative velocity unfolding

At the PDF level, you will be asked to supply the following information :

1. A RADAR data set name
2. A sweep number
3. The field type (reflectivity or velocity) to be edited

If you take the default value for any of these parameters, the appropriate list (data set catalog, sweep list, or field list) is displayed and you will be asked to select an entry from the list.

PROGRAM DESCRIPTION

RDEDIT TUTOR

PARAMETER	DESCRIPTION
-----	-----
SETNAME	RADAR data set name
SWEEPNUM	Sweep number
FIELDTYP	Field type

SETNAME specifies the RADAR data set you want to work with. If you accept the default value (SETNAME = " "), you may select a data set from the RADAR data set catalog.

SWEEPNUM is the RADAR sweep number you want to edit. If you accept the default value (SWEEPNUM = 0), you will be asked to select a sweep from the RADAR sweep summary list.

FIELDTYP is the reflectivity or velocity field type you want to edit. If you accept the default value (FIELDTYP = " "),

you will be asked to select a field type from a list of the reflectivity and/or velocity fields contained in the data set.

Some valid reflectivity/velocity field types are:

VE	Velocity	(Universal)
VL	Velocity	(Non-Universal)
VF	Folded Velocity	(Universal)
DZ	Reflectivity dBZ	(Universal)
RE	Reflectivity	(Non-Universal)
DM	Reflected Power dBm	(Universal)

RADAR DATA EDITING DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
RNGSTART	Starting gate range (km)
RNGEND	Ending gate range (km)
AZSTART	Starting azimuth angle (deg.)
AZEND	Ending azimuth angle (deg.)
ELSTART	Starting elevation angle (deg.)
ELEND	Ending elevation angle (deg.)
LUTNAME	Look up table names or "?" (Primary and Secondary) (5 characters maximum)
ANTENNA	Antenna direction (Informational)
FIELDS	R/V fields in sweep (Informational)
SELECT	Select field of interest
LOWDELR	Lower bound for deletion
HIGHDELR	Upper bound for deletion
LOWDELV	Lower bound for deletion
HIGHDELV	Upper bound for deletion
MINVEL	Minimum velocity
MAXVEL	Maximum velocity
NYQVEL	Nyquist velocity
GAPLIMIT	Max. no. of skipped gates
AVGCOUNT	No. of gates to average

RNGSTART is the starting gate range in units of KM.
RNGSTART must be greater than or equal to the minimum range for the selected sweep.

RNGEND is the ending gate range in units of KM. RNGEND must be less than or equal to the maximum range for the selected sweep.

AZSTART is the starting azimuth angle in degrees. AZSTART must be greater than or equal to the minimum azimuth angle

for the selected sweep.

AZEND is the ending azimuth angle in degrees. **AZEND** must be less than or equal to the maximum azimuth angle for the selected sweep.

ELSTART is the starting elevation angle in degrees. **ELSTART** must be greater than or equal to the minimum elevation angle for the selected sweep.

ELEND is the ending elevation angle in degrees. **ELEND** must be less than or equal to the maximum elevation angle for the selected sweep.

LUTNAME are the names of the lookup tables (LUTs) you want to apply to the BSCAN image. The names are for the primary and secondary LUTs, respectively. A valid LUT name consists of 'L' followed by up to four digits (i.e. L1 to L9999). If you set **LUTNAME(1) = "?"**, you may interactively select the LUTs to load from a list of LUT's in the catalog. If you set **LUTNAME(1) = " "**, the existing LUTs will be used.

ANTENNA is the antenna rotation direction : "Clockwise" or "Counter-clockwise". This parameter is purely informational in nature.

FIELDS specifies all the reflectivity and/or velocity fields contained in the sweep. This parameter is purely informational in nature.

ASSIGN to **SELECT** the name of the data field you want to edit. You must enter one of the two character names specified by "FIELDS".

LOWDELR is the reflectivity lower bound of data range you want to delete.

HIGHDELR is the reflectivity upper bound of the data range you want to delete.

LOWDELV is the velocity lower bound of the the data range you want to delete.

HIGHDELV is the velocity upper bound of the the data range you want to delete.

MINVEL is used in Absolute Unfolding. It specifies the lower bound of the valid data range into which the velocity data will be unfolded. The units are in meters/second.

MAXVEL is used in Absolute Unfolding. It specifies the upper bound of the valid data range into which the velocity data will be unfolded. The units are in meters/second.

NYQVEL is the Nyquist velocity of the sweep you selected. It is used in Relative Unfolding. The units are in meters/second.

GAPLIMIT is the maximum number of gates to be skipped in the relative unfolding process.

AVGCOUNT is the number of gates used for averaging in the relative unfolding process.

This dynamic tutor allows the altering of the window within which editing is desired and other deletion thresholds.

After specifying the desired window and various deletion thresholds, the REDIT BUTTON MENU is displayed and control goes to the function buttons and trackball. The following is a summary of all the radar editing button functions.

	A	B	C	D	F
3	DELETE DATA	UNDELETE DATA	ABSOLUTE UNFOLD	RELATIVE UNFOLD	EXIT
2	SWITCH RADAR SET	SWITCH RADAR SWEEP	SWITCH DATA AREA	EDIT PARAMETERS	HELP
1	DISPLAY DATA AREA	ACCEPT REFERENCE LOCATION	MOVE BOX	SHAPE BOX	ACCEPT

REDIT BUTTON MENU

Delete Data

Flags radar data within the graphics box area as "deleted". Only the data which falls within the specified deletion range is flagged. The B-SCAN display image is immediately updated to reflect the deletion.

Undelete Data

"Undeletes" radar data within the graphics box area. Data which was deleted within the specified deletion range is recovered. The B-SCAN display image is immediately updated to reflect the modification.

Absolute Unfold

Performs absolute velocity unfolding of the radar data

within the graphics box. The folded data is fitted into the specified range by adding or subtracting multiples of the nyquist velocity. The B-SCAN display image is immediately updated to reflect the unfolding. This function is enabled for velocity radar data only.

Relative Unfold

Performs velocity unfolding of the radar data within the graphics box starting at the reference line location and moving outward in both directions. Use the cursor to move the reference line within the box. Press the "Locate Reference Line" button to begin the relative unfolding process. The B-SCAN display image is immediately updated to reflect the unfolding. This function is enabled for velocity radar data only.

Locate Reference Line

Initiates the relative velocity unfolding process. Press this button to accept the location of the reference line within the graphics box. This function is used in conjunction with the Relative Unfold function.

Switch Radar Set

Reselect the radar data to display on the monitor. Specification of the data to display is provided by the following prompts:

RADAR DATASET CATALOG LIST
RADAR SWEEP SUMMARY LIST
FIELD SELECTION DYNAMIC TUTOR
BSCAN WINDOW DYNAMIC TUTOR
IMAGE SELECTION LIST

Switch Radar Sweep

Reselect the radar data to display on the monitor beginning with a radar sweep. The following selection lists and dynamic tutors are displayed:

RADAR SWEEP SUMMARY LIST
FIELD SELECTION DYNAMIC TUTOR
BSCAN WINDOW DYNAMIC TUTOR
IMAGE SELECTION LIST

Switch Data Area

Reselect the radar BSCAN data area to display on the monitor via the BSCAN WINDOW DYNAMIC TUTOR. The IMAGE SELECTION LIST is displayed for selection of an unlocked refresh memory for the BSCAN image.

Edit Parameters

Modify the default values of the parameters used in the RDEDIT program. For reflectivity data, the EDIT REFLECTIVITY PARAMETERS DYNAMIC TUTOR is displayed. For velocity data, the EDIT VELOCITY PARAMETERS DYNAMIC TUTOR is displayed.

Display Radar Data

Displays the actual radar data values which are within a 16-line by 16-pixel box area on the BSCAN image. The box area begins at the upper left corner of the graphics box.

Move Box and Shape Box

Move and shape the graphics box via the trackball.

Accept

Update the radar dataset. Radar edits are made in a temporary sweep file which is a copy of one radar sweep from the radar dataset. Pressing the Accept button causes the temporary sweep file to be written back to the dataset.

Help

Displays a brief summary of all the RDEDIT button functions.

Exit

Exits the RDEDIT program and returns to TAB.

PROGRAM RDRAIN

Convert Radar Reflectivity to Rainfall Rate

FUNCTIONAL DESCRIPTION

RDRAIN converts reflectivity (dBz) in a radar remapped image into rainfall rate (mm/hour), using the following equation :

$$Z = \text{COEFF} * \text{rainfall_rate} ** \text{EXPON}$$

where Z is in units of mm**6/m**3. COEFF and EXPON may be edited at the TAE level. The results are stored in a newly created image. If the IAT is allocated, the new image will be dropped to the monitor for your viewing.

PROGRAM DESCRIPTION

RDRAIN TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Disk/Directory Location
APPLYLUT	Apply LUT to Reflectivity Image? (YES,NO)
COEFF	Coefficient for Conversion
EXPON	Exponent for Conversion
SIMGDES	Image Description (8 character maximum)
LUTRAIN	LUTs for Rainfall Rate Image (Primary and Secondary) (" " - existing LUTs) ("?" - LUT list)
ANNOT	Annotation Flag (YES or NO)

INGROUP specifies the location (disk & directory) of the image on which the conversion is to be performed. It also specifies the location where the new rainfall rate image will be created.

APPLYLUT is used to control the loading of LUTs that have been linked to the reflectivity image by the LUTLINK proc. This mechanism allows automatic loading of desired LUTs when the image is dropped. The default value is NO, which indicates that the LUTs already present in the display device are not to be disturbed when the images are dropped. The value YES specifies that the linked LUTs are to be

loaded. If there are no linked LUTs or the specified LUTs cannot be located, then sequential LUTs will be loaded.

COEFF is the coefficient satisfying the equation :

$$Z = \text{COEFF} * \text{Rainfall_rate} ** \text{EXPON}$$

where Z is in units of mm**6/m**3.

EXPON is the exponent satisfying the equation :

$$Z = \text{COEFF} * \text{Rainfall_rate} ** \text{EXPON}$$

where Z is in units of mm**6/m**3.

SIMGDES is an 8-character short description of the rainfall rate image. This description will be stored in the image directory.

LUTRAIN are the names of the lookup table (LUTs) you want to apply to the rainfall rate image. The names are for the primary and secondary LUTs, respectively. A valid LUT name consists of 'L' followed by up to four digits (i.e. L1 to L9999). If you set LUTNAME(1) = "?", you may interactively select the LUTs to load from a list of LUTs in the catalog. If you set LUTNAME(1) = " ", the existing LUTs will be used.

ANNOT is a flag parameter which specifies whether or not the radar annotation is to be copied from the source remapped radar image to the rainfall image. A value of "YES" means that the rainfall image will have the identical annotation as the source remapped image. A value of "NO" means that no annotation will appear on the rainfall image.

3.5 Radar Utilities

PROGRAM RUBMEDIT

Edit Beam Headers

FUNCTIONAL DESCRIPTION

The RUBMEDIT program provides for interactive editing of the fields in a radar beam header. These fields are retrieved from the radar dataset and are displayed on the CRT screen for review and editing. The updated fields are written back to the radar dataset.

Specify a radar dataset to display the RADAR SWEEP SUMMARY LIST. Enter a sweep number to display the RADAR BEAM EDITING LIST. To edit a beam header, enter the beam number followed by the beam time in seconds relative to the sweep start time, the elevation angle in degrees, and the azimuth angle in degrees. After a beam header is modified, the RADAR BEAM EDITING LIST is re-displayed showing the new values. Enter "RUN" to update the radar dataset with the edited beam headers.

PROGRAM DESCRIPTION

RUBMEDIT TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input image group location
SETNAME	File name of the radar data set to be processed

INGROUP is the image group where the beam headers of the radar data set to be edited reside. The default image group is the one stored as the TAE global parameter F\$FILLOC. You won't be able to edit someone else's data set because of the file write protection.

SETNAME is the name of the radar data set and is a character string up to 9 characters long. For example, if the file name of the radar data set is "TEST.RAD", then the data set name should be "TEST". If the radar data set name is not specified, a list of the radar data sets in the radar catalog will be displayed on the CRT terminal for selection.

PROGRAM RUBMLIST

List Beam Headers

FUNCTIONAL DESCRIPTION

The RUBMLIST program displays detailed information about radar beams within a selected sweep. Beam information is retrieved from the radar dataset and displayed in the form of a RADAR BEAM HEADER LIST. This list may be viewed on the CRT screen or sent to the line printer for a hardcopy listing.

Specify a radar dataset to display the RADAR SWEEP SUMMARY LIST. Enter a sweep number to display the RADAR BEAM HEADER LIST. The following fields are displayed for each beam: the beam number, the beam time relative to the sweep start time (seconds), the elevation angle (deg), and the azimuth angle (deg). For PRINTER output, the RADAR SWEEP SUMMARY LIST is re-displayed after the RADAR BEAM HEADER LIST has been queued to the print device.

PROGRAM DESCRIPTION

RUBMLIST TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Image group location
SETNAME	File name of radar data set to process
DEVICE	Output device (TERMINAL, PRINTER)

INGROUP is the image group where the radar data set resides. The default group is the one stored as the TAE global parameter **F\$FILLLOC**. You may change its value to view the beam headers of the radar data in other image groups.

SETNAME is the name of the radar data set and is a character string up to 9 characters long. For example, if the file name of the radar data set is "TEST.RAD", then the data set name should be "TEST". If the radar set name is not specified, a list of the radar data sets in the radar catalog will be displayed on the terminal for selection.

DEVICE is the output device and can be either the CRT

terminal if the user intends to view the content of radar beam headers, or the line printer if the user prefers a hardcopy of the sweep header list. The valid values are

value of DEVICE	output device
-----	-----
"TERMINAL"	CRT terminal (default)
"PRINTER"	Printer

The output is printed on the printer device specified by the AOIPS2 printer device global variable F\$PRINT which can be changed by program PRINTER.

PROGRAM RUCMLIST

List Radar Remapping Command File

FUNCTIONAL DESCRIPTION

The RUCMLIST program displays the contents of a radar remapping command file. The RADAR REMAPPING COMMAND FILE LIST may be viewed on the CRT screen or sent to the line printer for a hardcopy listing.

PROGRAM DESCRIPTION

RUCMLIST TUTOR

PARAMETER -----	DESCRIPTION -----
DEVICE	Output Device (Terminal, Printer)
INGROUP	Group Location
CMDFILE	Name of Command File (RDREMAP.CMD only)

DEVICE specifies where the output is to go. Specify Terminal to see the output on your CRT, or Printer to get a listing on the line printer. The output goes to the printer device specified by the AOIPS2 printer device name global parameter F\$PRINT which can be changed by program PRINTER.

INGROUP specifies where the radar remapping command file is located. It defaults to the current image group directory location.

CMDFILE is the file name of the radar remapping command file. Currently, RDREMAP.CMD is the only valid name.

PROGRAM RUDM

Maintain Radar Dataset Catalog

FUNCTIONAL DESCRIPTION

The radar data set catalog keeps track of all radar data sets created in each subdirectory (group). The insertion of a new radar data set is automatically done in the ingest programs. But for data set from other source, this program allows you to insert them in the radar data set catalog and thus becomes legitimate to all radar application programs. Three subfunction modes are provided:

MODE = "INSERT"	Insert a Radar Data Set
MODE = "DELETE"	Delete a Radar Data Set
MODE = "UPDATE"	Update Descriptive Label

The selected radar data set is inserted, deleted, and updated with its descriptive label respectively. Deletion of any disk radar data set should be done by this program such that the radar data set catalog can be properly updated.

PROGRAM DESCRIPTION

RUDM TUTOR

PARAMETER	DESCRIPTION
-----	-----
INGROUP	Input Image Group Location
MODE	Maintenance subfunction mode Update - alter description Insert - insert a new dataset Delete - delete a radar dataset
SETNAME	File name of the radar dataset to be edited
DESC	Description of the radar dataset (Required for insert and update mode)

INGROUP is the image group where the radar data set to be maintained resides. The default image group is the one stored as the TAE parameter F\$FILLOC.

MODE is the type of operation to perform on the radar directory. The three maintenance modes are "INSERT", "DELETE", and "UPDATE". In "INSERT" mode, a dataset reference is added to the radar directory. If no radar

directory exists, one will be created. Please note that RU DM does not physically copy a dataset from one location to another; it is assumed that the dataset already resides in the location specified by INGROUP. In "DELETE" mode, the specified dataset is physically deleted and its reference removed from the directory. In "UPDATE" mode, the dataset description stored in the directory is modified. The default mode will be "UPDATE". The TAE parameter SETNAME must be specified when MODE - "INSERT".

SETNAME is the name of the radar data set and is a character string up to 9 characters long. For example, if the file name of the radar data set is "TEST.RAD", then the data set name should be "TEST". If the radar data set name is not specified, a list of the radar data sets in the radar catalog will be displayed on the terminal for selection.

DESC is a brief description of the radar dataset. The description may be up to 48 characters in length. DESC is applicable only for modes "INSERT" and "UPDATE". The default value of null string ("") is valid for "INSERT" mode, however, entering a meaningful description is recommended. The value of DESC is stored in the radar directory.

PROGRAM RUSWCOMP

Compress Radar Dataset

FUNCTIONAL DESCRIPTION

The RUSWCOMP program physically deletes sweeps that have been deactivated by the program RUSWDEL and, hence, compresses the radar dataset. After a dataset has been compressed, the deleted sweeps are not recoverable.

Specify a radar dataset to compress. A message is written to the CRT screen indicating that the compression is in progress. NOTE: The amount of available disk space must be at least the size of the dataset to be compressed.

PROGRAM DESCRIPTION

RUSWCOMP TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input image group location
SETNAME	File name of the radar data set to be compressed

INGROUP is the image group where the radar sweeps to be deleted resides. The default image group is the one stored as the TAE parameter F\$FILLOC. You may change it to any group location in your account for the radar file compression.

SETNAME is the name of the radar data set and is a character string up to 9 characters long. For example, if the file name of the radar data set is "TEST.RAD", then the data set name should be "TEST". If the radar data set name is not specified, a list of the radar data sets in the radar data set catalog will be displayed on the CRT terminal for selection.

PROGRAM RUSWDEL

Mark Sweeps for Deletion

FUNCTIONAL DESCRIPTION

The RUSWDEL program provides for deactivating undesirable sweeps in a radar dataset. These sweeps are merely flagged as deleted and are not physically deleted. A deleted sweep is not "known" to any of the radar applications programs.

Specify a radar dataset to display the RADAR SWEEP SUMMARY LIST. To mark a sweep for deletion, enter the sweep number. Once a sweep has been flagged as deleted, the RADAR SWEEP SUMMARY LIST is re-displayed. To recover a sweep marked for deletion, run program RUSWREC. To physically delete all sweeps marked for deletion, run program RUSWCOMP.

PROGRAM DESCRIPTION

RUSWDEL TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input image group location
SETNAME	File name of the radar data set to be deleted

INGROUP is the image group where the radar sweeps to be deleted reside. The default image group is the one stored as the TAE global parameter F\$FILLOC. You may change it to delete radar sweeps in any other image group in your account.

SETNAME is the name of the radar data set and is a character string up to 9 characters long. For example, if the file name of the radar data set is "TEST.RAD", then the data set name should be "TEST". If the radar data set name is not specified, a list of the radar data sets in the radar data set catalog will be displayed on the terminal for selection.

PROGRAM RUSWEDIT

Edit Sweep Headers

FUNCTIONAL DESCRIPTION

The RUSWEDIT program provides for interactive editing of selected fields in a radar sweep header. These fields are retrieved from the radar dataset and are displayed on the CRT screen for review and editing. The updated fields are written back to the radar dataset. The following items and their values will be displayed on terminal:

- Range of starting gate
- Range of ending gate
- Gate spacing
- Sweep start date and time
- Station latitude, longitude
- Station elevation angle
- Velocity scaling factor
- Pulse repetition time

Select a radar dataset by specifying INGROUP and SETNAME. Then, select a sweep to edit from the RADAR SWEEP SUMMARY LIST.

PROGRAM DESCRIPTION

RUSWEDIT TUTOR

PARAMETER	DESCRIPTION
-----	-----
INGROUP	Input image group location
SETNAME	File name of the radar dataset to be edited

INGROUP is the image group where the radar dataset to be edited is resides. The default image group is the one stored as the TAB global parameter F\$FILLOC.

SETNAME is the name of the radar data set and is a character string up to 9 characters long. For example, if the file name of the radar data set is "TEST.RAD", then the data set name should be "TEST". If the radar data set name is not specified, a list of the radar data sets in the radar catalog will be displayed on the CRT terminal for selection.

EDIT RADAR SWEEP HEADER DYNAMIC TUTOR

PARAMETER	DESCRIPTION
DATE	Sweep start date (YYMMDD)
TIME	Sweep start time (HHMMSS)
LATSTATN	Station latitude (deg)
LONSTATN	Station longitude (deg)
ELVSTATN	Station elevation (km)
FIELD	Field Type
PRT	Pulse repetition time (microsec)
SCALEFAC	Data scale factor
BINSPACE	Bin or gate spacing (km)
MINRANGE	Range of starting gate (km)
MAXRANGE	Range of ending gate (km)

DATE is the starting date of the sweep. Values are entered in the form of YYMMDD, where YY is the year, MM is the month, and DD is the day of month. For example, a sweep starting on January 8, 1981 would have a value of 810108.

TIME is the starting time of the sweep. Values are entered in the form of HHMMSS, where HH is the hour, MM is the minutes, and SS is the seconds. For example, a sweep starting at 15:27:59 would have a value of 152759.

LATSTATN is the latitude of the radar station in units of degrees. The valid latitude range is between -90.0 and +90.0 degrees, inclusive.

LONSTATN is the longitude of the radar station in units of degrees. The valid longitude range is between -180.0 and +180.0 degrees, inclusive.

ELVSTATN is the elevation of the radar station in units of kilometers. The valid range is between 0.0 and 10.0 km, inclusive.

FIELD is a list of all the data fields in the sweep. The position of a field in the list indicates its relative position within the sweep. A sweep may contain a maximum of five fields. Each field is assigned a unique two-character name. Some valid field name values are:

DZ	Reflectivity
VE	Velocity
VF	Folded Velocity

For example, a sweep having velocity data followed by reflectivity data has FIELD values of VF and DZ.
Note: FIELD should only be edited if a field name is incorrect. The relative positions of the fields within a sweep cannot be changed after the dataset is created.

PRT is the pulse repetition time in units of microseconds. The valid range is between 0 and 1000000 microseconds, inclusive.

SCALEFAC is the data scale factor for each field in the sweep. A data scale factor is a value by which each data point in the sweep is divided in order to obtain its true value. The valid range is from 1 to 1000. SCALEFAC is positional, that is, the first scale factor is applied to the first field in the sweep, the second scale factor is applied to the second field, and so on.

BINSPACE is the bin (gate) spacing in units of kilometers for each field in the sweep. The bin spacing is the distance between each gate within a beam. The valid range is between 0.0 and 1000.0 km. BINSPACE is positional, that is, the first bin spacing applies to the first field in the sweep, the second bin spacing applies to the second field, and so on.

MINRANGE is the minimum range in kilometers of each field contained in the sweep. The minimum range is the distance from the radar station to the middle of the first gate. The valid range is between 0.0 and 1000.0 km. MINRANGE is positional, that is, the first minimum range applies to the first field in the sweep, the second minimum range applies to the second field in the sweep, and so on.

MAXRANGE is the maximum range in kilometers of each field contained within the sweep. The maximum range is the distance from the radar station to the middle of the last gate. The valid range is between 0.0 and 10000.0 km. MAXRANGE is positional, that is, the first maximum range applies to the first field in the sweep, the second maximum range applies to the second field in the sweep, and so on.

The EDIT RADAR SWEEP HEADER dynamic tutor allows modification of selected information of the sweep header in the disk radar data set. Each parameter displayed on the editing menu must be given a correct value. The radar data set will be updated after RUN command.

PROGRAM RUSWLIST

List Sweep Headers

FUNCTIONAL DESCRIPTION

The RUSWLIST program displays detailed information about radar sweeps. Sweep information is retrieved from the radar dataset and displayed in the form of a RADAR SWEEP SUMMARY LIST and a SWEEP HEADER DISPLAY. These lists may be viewed on the CRT screen or sent to the line printer for a hardcopy listing.

Specify a radar dataset to display the RADAR SWEEP SUMMARY LIST. Enter a sweep number to display the SWEEP HEADER DISPLAY.

The scan time, scan coverage and beam count stored in each sweep header will be retrieved from a disk radar data set. A summary list is either displayed on CRT terminal or printed at the line printer.

PROGRAM DESCRIPTION

RUSWLIST TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input Image Group location
SETNAME	File name of the radar data set to be processed
DEVICE	Output device (Terminal, Printer)

INGROUP is the image group where the radar data set to be listed resides. The default image group is the one stored as the TAE global parameter F\$FILLOC. You may change its value to view a radar sweep list in any other image group.

SETNAME is the radar dataset name with a maximum length of nine characters. For example, if the file name of the radar dataset is "TEST.RAD", then the data set name should be "TEST". If the radar data set name is not specified, a list of the radar data sets in the radar catalog will be displayed on the CRT terminal for selection.

DEVICE specifies which output device will be used to list the radar sweep information. The valid values are:

value of DEVICE	output device
-----	-----
"TERMINAL"	CRT terminal
"PRINTER"	Printer

The output will be printed on the printer device specified by the AOIPS/2 printer device global variable F\$PRINT which can be changed by program PRINTER.

PROGRAM RUSWREC

Recover Sweeps from Deletion

FUNCTIONAL DESCRIPTION

The RUSWREC program provides for reactivating radar sweeps which were previously deactivated by program RUSWDEL. A recovered sweep is once again "known" to all radar applications programs. Sweeps that have been flagged as deleted are recoverable since they have not been physically deleted. However, once a radar dataset is compressed by program RUSWCOMP, all sweeps flagged as deleted are physically deleted and, hence, are not recoverable.

Specify a radar dataset to display the RADAR SWEEP SUMMARY LIST. To recover a sweep from deletion, enter the sweep number. Once a sweep has been reactivated, the RADAR SWEEP SUMMARY LIST is re-displayed.

PROGRAM DESCRIPTION

RUSWREC TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input image group location
SETNAME	File name of the radar data set to be edited

INGROUP is the image group where the radar data to be recovered resides. The default image group is the one stored as the TAE global parameter F\$FILLLOC. You may change it to recover radar sweeps from any other radar data set in your account.

SETNAME is the name of the radar data set and is a character string up to 9 characters long. For example, if the file name of the radar data set is "TEST.RAD", then the data set name should be "TEST". If the radar data set name is not specified, a list of the radar data sets in the radar data set catalog will be displayed on the terminal for selection.

CHAPTER 4

AIRCRAFT DATA PROCESSING

4.1 Aircraft Ingest Programs

PROGRAM AMMS

Ingest Sensor Data from an AMMS Tape

FUNCTIONAL DESCRIPTION

AMMS ingests Advanced Microwave Moisture Sensor (AMMS) datasets for user-specified time periods. The aircraft dataset directory catalog is updated for each new dataset ingested.

The AMMS is a four-channel passive scanning radiometer operating at frequencies of $92 + 2$, $183 + 2$, $183 + 5$, and $185 + 9$ Gigahertz. The instrument scientist for the AMMS is Dr. T. Wilheit of GSFC Code 675.

NOTE:

The navigation data ingest software is limited to processing datasets with no more than 4096 scan lines (about 200 minutes of AMMS data). A dataset larger than 4096 scan lines will not be able to have associated navigation ingested.

PROGRAM DESCRIPTION

AMMS TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory for dataset storage

DIRLOC is the disk/directory location where the AMMS dataset(s) will be stored.

AMMS DATASET INGEST PARAMETERS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
STARTIME	Starting time in HHMMSS
STOPTIME	Ending time in HHMMSS
STRTDAT	Starting date in YYMMDD
STPDAT	Ending date in YYMMDD
FILENO	Tape file number
CHANNELS	Channels to be saved
PRECISON	Data precision in bits
MAXTMP	Maximum temperature (degrees Kelvin)
MINTMP	Minimum temperature (degrees Kelvin)
AIRCRAFT	Aircraft collecting data
MISSION	Mission number for data
FLIGHT	Flight number for each segment
DESCRIPT	Description of data set
TAPEDRV	Tape drive

STARTIME is the starting time in HHMMSS format. Valid values are "0" to "235959".

STOPTIME is the ending time in HHMMSS format. Valid values are "0" to "235959".

STRTDAT is the starting date in YYMMDD format. Valid values are "790001" to "991231".

STPDAT is the ending date in YYMMDD format. Valid values are "790001" to "991231".

FILENO is the tape file number of the dataset to be ingested.

CHANNELS are the channels to be ingested. AMMS data are defined as follows: chan 1 : 183+2 GHz, chan 2 : 183+5 GHz, chan 3: 183+9 GHz, and chan 4: 92+2 GHz.

PRECISION is the data precision in bits. Eight bits is the default precision; it is sufficient for image analyses.

MAXTMP is the maximum temperature in degrees Kelvin. The default value is 310.0 degrees.

MINTMP is the minimum temperature in degrees Kelvin. The default value is 50.0 degrees.

AIRCRAFT is the aircraft name. Valid strings are "ER2", "U2", or "C990". The default is "ER2".

MISSION is the mission number for the dataset. Any two-character string from 1 to 99 is acceptable.

FLIGHT is the flight line line number for the dataset. It may be any two-character string up to 99.

DESCRIPT is the description which will appear in the aircraft dataset directory.

TAPEDRV is the tape drive used for ingesting the AMMS data.

The AMMS DATASET INGEST PARAMETERS DYNAMIC TUTOR prompts the user for parameters needed to ingest AMMS data from tape. Starting and ending times are given in HHMMSS format, starting and ending dates are given in YYMMDD format. (Be sure to check whether the dataset to be ingested crosses a date boundary.)

Data may be stored in either 8-bit or 16-bit precision. 8-bit precision is sufficient for image analysis. By default, all four channels of AMMS data are ingested.

Select the maximum and minimum temperature values so that they represent the range of the data to be ingested. This will optimize the scaling done for conversion to grey levels for display on the IAT device.

PROGRAM INGNV

Ingest Aircraft Navigation Data from UNIVERSAL or NRS Tape

FUNCTIONAL DESCRIPTION

INGNAV ingests data collected from the Inertial Navigation System on the ER-2 aircraft. These data can be ingested from either "NRS" or "UNIVERSAL" format tapes. The GSFC Universal format is a format for aircraft navigation data established by Code 617.

Knowledge of the file location for a given date/time on the navigation tape is not required to run the program. However, the reference number(s) of the sensor datasets for which the navigation will be ingested must be provided. By using the default value of 0, a directory of sensor datasets will appear, from which selection of the appropriate reference number(s) can be made. Only one dataset is ingested at a time, but a maximum of 15 reference numbers may be entered before the procedure is executed.

IMPORTANT NOTE:

The navigation ingest software has a limitation of ingesting no more than 4096 scan lines. This amounts to about 200 minutes of AMMS data, and 20 minutes of MCR data. Sensor datasets larger than this cannot have navigation ingested.

PROGRAM DESCRIPTION

INGNAV TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Tape drive for ingest
DIRECTRY	Disk/directory location for sensor datasets
TYPETAPE	Navigation tape format (e.g., NRS or UNIVERSAL)
DATASETS	Sensor dataset number(s)
DESCRIPT	Navigation dataset description

TAPEDRV is the tape drive to be used for ingesting the navigation dataset(s).

DIRECTRY is the aircraft dataset directory containing the sensor datasets for which navigation data are to be

ingested.

DATASETS refers to the aircraft dataset reference number(s) for which navigation data are to be ingested. The default value of 0 produces the aircraft directory list, from which selection(s) can be made. A maximum of 15 reference numbers may be entered.

DESCRIPT is the description which will be attached to the navigation dataset in the aircraft directory listing. It may be a maximum of 48 characters.

PROGRAM MCR

Ingest Sensor Data from an MCR Tape

FUNCTIONAL DESCRIPTION

MCR ingests Multi-spectral Cloud Radiometer (MCR) datasets for user-specified time periods. The aircraft dataset directory catalog is updated for each new dataset ingested.

The MCR is a seven-channel passive scanning visible/near-IR/thermal-IR radiometer with detectors at wavelengths of 0.754, 0.761, 0.763, 1.362, 1.645, 2.160, and 10.842 micrometers. (The exact wavelengths may vary with each field experiment. Users should check the documentation provided by Code 617 for details.) The instrument scientist for the MCR is Dr. J. Spinhirne of GSFC Code 617.

NOTE:

The navigation data ingest software is limited to processing data sets with no more than 4096 scan lines (about 20 minutes of MCR data). A dataset larger than 4096 scan lines will not be able to have associated navigation ingested.

The MCR datasets are very voluminous. Because of virtual memory limitations of the computer system, it is advisable to ingest MCR data in increments of 3 to 4 "channels" for a given flight track if the track is more than 10 minutes in length.

PROGRAM DESCRIPTION

MCR TUTOR

PARAMETER	DESCRIPTION
DIRLOC	Disk/directory for dataset storage

DIRLOC is the disk/directory location where the MCR dataset(s) will be stored.

MCR DATASET INGEST PARAMETERS DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
STARTIME	Starting time in HHMMSS
STOPTIME	Ending time in HHMMSS
STRDATE	Starting date in YYMMDD
STPDATE	Ending date in YYMMDD
FILENO	Tape file number
CHANNELS	Channel numbers to be ingested, corresponding to field names given in the next parameter (FLDNAME)
FLDNAME	Field name for each channel to be ingested, corresponding to channel number given in the previous parameter (CHANNELS)
PRECISON	Data precision in bits
AIRCRAFT	Aircraft collecting data
MISSION	Mission number for data
FLIGHT	Flight number for each segment
DESCRIPT	Description of dataset
TAPEDRV	Tape drive

STARTIME is the starting time in HHMMSS format. Valid values are "0" to "235959".

STOPTIME is the ending time in HHMMSS format. Valid values are "0" to "235959".

STRDATE is the starting date in YYMMDD format. Valid values are "790001" to "991231".

STPDATE is the ending date in YYMMDD format. Valid values are "790001" to "991231".

FILENO is the tape file number of the dataset to be ingested.

CHANNELS are the MCR channels to be ingested. Up to seven (7) channels may be ingested in any order. It is advisable to only ingest 3 or 4 MCR channels at once due to the size of the MCR datasets.

NOTE:

For AN OPTICAL THICKNESS MCR tape, ONLY channel 1 can be specified, but it can be repeated for the valid field names.

FLDNAME is the field name which describes the type of data which are to be ingested. "COUNTS" is the default value,

and is the digital counts for the dataset.

The following field names are valid for channels 1-6:

- 1) "COUNTS", 2) "VOLTS", 3) "RADIANCE", 4) "TEMPERATURE",
- 5) "REFLECTION FUNCTION".

NOTE:

Channel 7 can have all of the field names above EXCEPT "REFLECTION FUNCTION".

Field names should correspond to the channel numbers specified in CHANNELS. For example, if channel 7 and channel 1 are specified as the channels to ingest, then if channel 7 is to be "RADIANCE" and channel 1 is to be "REFLECTION FUNCTION", FLDNAME should appear as follows:

FLDNAME(1) = RADIANCE
FLDNAME(2) = REFLECTION FUNCTION

NOTE:

For an MCR OPTICAL THICKNESS tape, the valid fields are:

- 1) "COUNTS", 2) "VOLTS", 3) "RADIANCE",
- 4) "TEMPERATURE", 5) "REFLECTION FUNCTION", and
- 6) "OPTICAL THICKNESS".

PRECISION is the data precision in bits. Eight bits is the default precision; it is sufficient for image analyses.

AIRCRAFT is the aircraft name. Valid strings are "ER2", "U2", or "C990". The default is "ER2".

MISSION is the mission number for the dataset. Any two-character string from 1 to 99 is acceptable.

FLIGHT is the flight line number for the dataset. It may be any two-character string up to 99.

DESCRIPT is the description which will appear in the aircraft dataset directory.

TAPEDRV is the tape drive used for ingesting the MCR data.

The MCR DATSET INGEST PARAMETERS DYNAMIC TUTOR prompts the user for parameters needed to ingest MCR data from tape. Starting and ending times are given in HHMMSS format, starting and ending dates are given in YYMMDD format. (Be sure to check whether the dataset to be ingested crosses a date boundary.)

Data may be stored in either 8-bit or 16-bit precision; 8-bit precision is sufficient for image analysis. By default, MCR counts from channel 1 are ingested.

Data for channels 1-6 may be ingested as digital counts, volts, radiance (in mW/cm**2/micrometer/steradian), brightness temperature (degrees Kelvin), or reflection function. The reflection function is defined as the ratio of the measured radiance at a given azimuth and observation angle to the incident solar irradiance. The reflection function can be related to the optical thickness of a cloud.

Data for channels 7 may be ingested for every field name EXCEPT reflection function. The user is advised to ingest channel 7 data as radiance for performing image analysis. Software for the Button Board utility automatically converts radiance to brightness temperature.

Optical thickness MCR tapes only have channel 1 data. In addition to the field names listed above, optical thickness is also a valid name.

MCR FIELD VALUES SELECTION DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
MINVALUE	Minimum value for corresponding field type of each channel selected
MAXVALUE	Maximum value for corresponding field type of each channel selected

MINVALUE is the minimum value for the corresponding field type of each channel of MCR data selected for ingest. Defaults for MINVALUE are:

Chan	Counts	Volts	Radiance	Temp	Refl Func
1	0.0	0.0	0.0	200.0	0.0
2	0.0	0.0	0.0	200.0	0.0
3	0.0	0.0	0.0	200.0	0.0
4	0.0	0.0	0.0	200.0	0.0
5	0.0	0.0	0.0	200.0	0.0
6	0.0	0.0	0.0	200.0	0.0
7	0.0	0.0	0.06	185.0	NA

The default of MINVALUE for "OPTICAL THICKNESS" is 0.0.

MAXVALUE is the maximum value for the corresponding field type of each channel of MCR data selected for ingest.

Defaults for MAXVALUE are:

Chan	Counts	Volts	Radiance	Temp	Refl Func
1	1023.0	5.0	50.0	300.0	2.0
2	200.0	5.0	50.0	300.0	2.0
3	800.0	5.0	50.0	300.0	2.0
4	1023.0	5.0	50.0	300.0	2.0
5	1023.0	5.0	50.0	300.0	2.0
6	200.0	5.0	50.0	300.0	2.0
7	1023.0	5.0	1.12	310.0	NA

The default of MAXVALUE for "OPTICAL THICKNESS" is 10.0.

The MCR FIELD VALUES SELECTION DYNAMIC TUTOR prompts the user for the maximum and minimum values for the field type which is to be ingested (counts, volts, radiance, brightness temperature, reflection function or optical thickness). Defaults for the maximum and minimum values are obtained from a dynamic table in the software.

Selection of maximum and minimum values which are close to the data values will provide the optimum dynamic range for grey level display on the IAT device.

PROGRAM MMSNAV

Ingest Aircraft Navigation Data from an MMS Tape

FUNCTIONAL DESCRIPTION

MMSNAV ingests data collected by the Meteorological Monitoring System (MMS) sensor, which monitors the Inertial Navigation System on the ER-2 aircraft.

Knowledge of the file location for a given date/time on the navigation tape is not required to run the program. However, the reference number(s) of the sensor datasets for which the navigation will be ingested must be provided. By using the default value of 0, a directory of sensor datasets will appear, from which selection of the appropriate reference number(s) can be made. Only one navigation dataset is ingested at a time, but a maximum of 15 reference numbers may be entered before the procedure is executed.

IMPORTANT NOTE:

The navigation ingest software has a limitation of ingesting no more than 4096 scan lines. This amounts to about 200 minutes of AMMS data, and 20 minutes of MCR data. Sensor datasets larger than this cannot have navigation ingested.

PROGRAM DESCRIPTION

MMSNAV TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Tape drive for ingest
DIRECTRY	Disk/directory location for sensor datasets
DATASETS	Sensor dataset number(s)
DESCRIPT	Navigation dataset description

TAPEDRV is the tape drive to be used for ingesting the navigation dataset(s).

DIRECTRY is the aircraft dataset directory containing the sensor datasets for which navigation data are to be ingested.

DATASETS refers to the aircraft dataset reference number(s)

for which navigation data are to be ingested. The default value of 0 produces the aircraft directory list, from which selection(s) can be made. A maximum of 15 reference numbers may be entered.

DESCRIPT is the description which will be attached to the navigation dataset in the aircraft directory listing. It may be a maximum of 48 characters.

PROGRAM NONAVING

Create Aircraft Navigation Data from Flight Line Position

FUNCTIONAL DESCRIPTION

NONAVING creates a nominal navigation file from the user input of two end points of a flight line and a nominal aircraft altitude. The navigation is generated assuming a linear flight path at constant altitude.

IMPORTANT NOTE:

The navigation ingest software has a limitation of ingesting no more than 4096 scan lines. This amounts to about 200 minutes of AMMS data, and 20 minutes of MCR data. Sensor datasets larger than this cannot have navigation created.

PROGRAM DESCRIPTION

NONAVING TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk/directory location
LATS	Starting/ending latitudes (DDMMSS)
LONGS	Starting/ending longitudes (DDMMSS)
ALTITUDE	Aircraft altitude (km)
DESCRIPT	Dataset description

DISDIR is the disk/directory location for the aircraft sensor dataset(s) for which nominal navigation is to be created.

LATS is a two-parameter field of the starting and ending latitudes (DDMMSS) for the flight line.

LONGS is a two-parameter field of the starting and ending longitudes (DDMMSS) for the flight line.

ALTITUDE is the nominal aircraft altitude in kilometers.

DESCRIPT is the description which will appear in the aircraft dataset directory.

4.2 Aircraft Analysis Programs

PROGRAM AIRIMG

Create Aircraft Reduced or Subscene Image(s)

FUNCTIONAL DESCRIPTION

AIRIMG creates an aircraft reduced or subscene image(s) from an aircraft sensor dataset. Images can be created with or without an allocated IAT device. If the IAT is allocated, the dynamic image will be appear on the monitor.

A reduced image must be created first before any subscenes can be created. A reduced image is one which has been subsampled by every n-th line in order to get data from the entire dataset displayed on the 512 pixel by 512 line monitor. The number 'n' is determined from the number of scan lines in the aircraft dataset. Reduced images may be saved to disk for later remapping.

A subscene image is a full-resolution aircraft image which can be selected in one of four ways: by scan line number, by time, by latitude/longitude, or by a graphics box. For the first three cases, the values input will be the center of the subscene image. For the last case, the graphics box defines the limits of the subscene. The graphics box will be proportionally sized so that the maximum subscene size will be 512 pixels by 512 lines.

In most cases (i.e., with average-sized datasets), AMMS reduced and subscene images will be equivalent, and only subscene images need to be saved to disk.

PROGRAM DESCRIPTION

AIRIMG TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location
IATFLAG	IAT allocation flag (YES,NO)

DIRLOC specifies the disk/directory location of the aircraft sensor dataset from which images will be created. Aircraft image(s) will be cataloged in this location.

IATFLAG is a flag which indicates whether the IAT device is allocated. If "YES" is specified, but the device is NOT allocated, the user will be prompted as to whether processing should continue.

Select an aircraft dataset for the creation of images from the AIRCRAFT DATASET DIRECTORY LIST.

The following IIS button menu appears after the tutor is invoked:

	A	B	C	D	F
3	Re-select dataset	Re-select channel to reduce	Re-select channel to subscene	Reduce aircraft image	Exit
2	Select subscene by scan #	Select subscene by time	Select subscene by lat/lon	Select subscene by box	Help
1			Move Box	Shape Box	Accept Box

AIRIMG BUTTON MENU

1C: Move Box

Moves graphics box used for selecting subscene bounds

1D: Shape Box

Shapes graphics box used for selecting subscene bounds

1F: Accept Box

Accepts box location/size to create subscene image

2A: Select Subscene by Scan Line #

Generates subscene with center at scan line number entered

2B: Select Subscene by Time

Generates subscene with center at HHMMSS entered

2C: Select Subscene by Lat/Lon

Generates subscene with center at DDMMSS lat/lon entered

2D: Select Subscene by Box

Enables graphics box for selection of aircraft subscene

2F: Help

Lists IIS button functions

3A: Re-Select Dataset

Presents A/C Dataset Directory for new dataset selection

3B: Re-Select Channel to Reduce

Presents channels list for new (single) channel to reduce

3C: Re-Select Channels to Subscene

Presents channel list for new channel(s) to subscene

3D: Reduce Aircraft Image

Reduces (subsamples) A/C dataset to give full monitor image

3F: Exit

Exits AIRIMG program

PROGRAM AIRMAP

Remap an Aircraft Image

FUNCTIONAL DESCRIPTION

AIRMAP remaps a reduced or subscene aircraft image to a user-specified spatial resolution. The remapping employs a linear interpolation scheme with nearest-neighbor resampling. The remapped image will contain evenly-spaced pixels, with the center of the remapping at the image center.

PROGRAM DESCRIPTION

AIRMAP TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location

DIRLOC specifies the disk/directory location of the image directory of interest.

AIRCRAFT SENSOR DATA REMAPPING PARAMETERS DYNAMIC TUTOR

PARAMETER	DESCRIPTION
SPATIAL	Left-right spatial resolution at nadir (meters) (for info only)
SAMPLING	Line sampling of unremapped image (meters) (for info only)
PIXCEN	Center pixel of remapping (image coordinates)
LINCEN	Center line of remapping (image coordinates)
RESOL	Spatial resolution of new image (meters/pixel)
NADIROFF	Nadir offset (information only)
CLDALT	Height of interest (km)
ALTITUDE	Aircraft altitude (km)
AIRSPEED	Aircraft speed (m/sec)
SCANRATE	Scanner spin rate (rotations/sec)
ANGRESOL	Angular resolution (milli-radians)
SHORTD	Image short description (8 characters max)
DESC	Image description (48 characters max)

SPATIAL is the left-right spatial resolution of the image at nadir in meters. This field is computed from the sensor scan parameters. It is provided for information only.

SAMPLING is the line sampling, which is the distance between two consecutive scan lines on the unremapped image. The assumption is made that the aircraft travels at a constant speed, hence

$$\text{SAMPLING} = \text{aircraft speed} / \text{scanner spin rate}.$$

This field is provided for information only.

PIXCEN is the pixel number on the unremapped image about which the remapping will be performed. This pixel will become the center pixel of the remapped image. Note that PIXCEN is in image (not screen) coordinates.

LINCEN is the line number on the unremapped image about which the remapping will be performed. This line will become the center line of the remapped image. Note that LINCEN is in image (not screen) coordinates.

RESOL is the spatial resolution of the remapped image in

units of meters/pixel. RESOL may not be greater than SAMPLING. The value will be stored in the label of the remapped image.

NADIROFF is the number of fields-of-view (FOVs) from the start pixel number on the unremapped image to the nadir FOV. If NADIROFF is less than zero or greater than the number of pixels in the unremapped image, then the subscene image does not contain any data along nadir.

CLDALT is the estimated average cloud top altitude in kilometers. The default is 12 km. The value of CLDALT will be stored in the label of the remapped image.

ALTITUDE is the average aircraft altitude in kilometers over the image region. The default value is obtained from the navigation dataset. A value of 0.0 for ALTITUDE indicates that the aircraft altitude is unavailable (most likely because there is no navigation file linked to the image). Erroneous values may appear due to missing or bad data in the navigation dataset. The user should check this value for consistency. The value of ALTITUDE will be stored in the label of the remapped image.

AIRSPEED is the average aircraft speed in meters/second over the image region. A value of 0.0 for AIRSPEED indicates that the aircraft speed is unavailable (most likely because there is no navigation file linked to the image). Erroneous values may appear due to missing or bad data in the navigation dataset. The user should check this value for consistency. The value of AIRSPEED will be stored in the label of the remapped image.

SCANRATE is the scanner spin rate in rotations per second. It is obtained from the image label of the unremapped image. The user should check this value for consistency.

ANGRESOL is the angular resolution of the scanner in milli-radians per pixel. This value is obtained from the image label of the unremapped image. The user should check this value for consistency.

SHORTD is the description of the remapped image which will be stored in the image directory when the image is cataloged. It may be a maximum of 8 characters.

DESC is the image descriptive label of the remapped image which will be stored in the image directory when the image is cataloged. It may be a maximum of 48 characters.

The AIRCRAFT SENSOR DATA REMAPPING PARAMETERS DYNAMIC TUTOR prompts the user for parameters to be used in remapping a reduced or subscene aircraft image. The remapping

employs a linear interpolation scheme with nearest-neighbor resampling.

User inputs are the center of the remapping (image pixel,line) and the new pixel resolution of the remapped image. The remapped image will contain evenly-spaced pixels, with the center of remapping at the image center.

PROGRAM MCRAPP

Append Calculated Ratios to an MCR Dataset

FUNCTIONAL DESCRIPTION

MCRAPP calculates the ratio of the reflection functions for specified "channels" and appends these data to the MCR dataset. The aircraft dataset directory is appropriately updated.

Reflectance ratios of various MCR channels are useful for the estimation of a variety of cloud physical properties. The ratios which can be calculated are: 0.761/0.754, 0.761/0.754, 1.362/0.754, 1.645/0.754, 2.160/0.754, and 1.645/1.362. (All numbers listed are wavelengths in micrometers.)

PROGRAM DESCRIPTION

MCRAPP TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location of dataset
CALCTYP	Calculation to be performed (RATIO)

DIRLOC is the disk/directory location of the MCR dataset for which specified ratios will be calculated.

CALCTYP is the type of calculation to be performed. The only valid type currently implemented is "RATIO".

MCR RATIO RANGE SELECTION DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
MINVALUE	Minimum value for corresponding ratio selected
MAXVALUE	Maximum value for corresponding ratio selected

MINVALUE is the minimum value for the corresponding ratio of MCR "channels" selected for calculation. The default value is 0.0.

MAXVALUE is the maximum value for the corresponding ratio of MCR "channels" selected for calculation. The default value is 1.0.

The MCR RATIO RANGE SELECTION DYNAMIC TUTOR prompts the user for the maximum and minimum values for the ratios which are to be calculated. Defaults for the maximum and minimum values are obtained from a dynamic table in the software.

Selection of maximum and minimum values which are close to the data values will provide the optimum dynamic range for grey level display on the IAT device. If the maximum value is set lower than the actual maximum, values which are in excess of this will be set to 255. If the minimum value is set lower than the actual minimum, values which are lower than this will be set to 0.

4.3 Aircraft Utility Functions

PROGRAM AIRADD

Add an Aircraft Dataset to an Existing Aircraft Directory

FUNCTIONAL DESCRIPTION

AIRADD adds any existing aircraft sensor dataset to the user's own aircraft directory. If a corresponding navigation dataset exists, it will also be copied. The user's aircraft directory will be updated accordingly.

NOTE: This proc will only add sensor datasets or sensor/navigation dataset pairs. It will NOT add a navigation dataset to an existing sensor dataset.

PROGRAM DESCRIPTION

AIRADD TUTOR

PARAMETER	DESCRIPTION
-----	-----
SOURCDIR	Source location (disk/directory) of aircraft dataset
DESTDIR	Destination location (disk/directory) of aircraft dataset

SOURCDIR is the disk/directory location of the aircraft directory FROM WHICH the dataset to be added will be selected.

DESTDIR is the disk/directory location of the aircraft directory TO WHICH the selected dataset will be added.

AIRCRAFT DATASET TRANSFER PARAMETERS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Tape drive (MTAO:,MFAO:)
DENSITY	Tape density (1600,6250)
TAPDRV	Tape drive (MTAO:,MFAO:)

TAPEDRV specifies the tape drive to which the aircraft dataset will be written.

DENSITY specifies the density of the tape to which the aircraft dataset will be written.

TAPDRV specifies the tape drive from which the aircraft dataset is to be read.

The AIRCRAFT DATASET ADD PARAMETERS tutor prompts the user for parameters necessary for copying an aircraft dataset to tape from an existing aircraft directory.

PROGRAM AIRDEL

Delete an Aircraft Dataset and/or Navigation File

FUNCTIONAL DESCRIPTION

AIRDEL deletes an aircraft sensor dataset and/or associated navigation dataset from the aircraft directory. The files on disk will be deleted, and the aircraft directory will be updated accordingly.

PROGRAM DESCRIPTION

AIRDEL TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC WHAT	Disk/directory location Files to delete (DATASET, NAVIGATION, BOTH)

DIRLOC specifies the disk/directory location of the aircraft directory of interest.

WHAT specifies the type of deletion to be performed. Valid choices are: "DATASET", "NAVIGATION", or "BOTH". "BOTH" deletes both the sensor and navigation datasets, "DATASET" and "NAVIGATION" delete only the sensor or navigation files, respectively. The user should note that navigation on aircraft images can only be performed for those aircraft sensor images which have navigation files linked to them.

PROGRAM ARLINK

Link Aircraft Sensor Image(s) to Aircraft Navigation

FUNCTIONAL DESCRIPTION

ARLINK links images to aircraft navigation files. This program is useful for linking aircraft sensor image files to aircraft navigation files for cases in which the images were created before the navigation dataset was ingested.

The aircraft dataset directory must reside in the same disk/directory location as the aircraft sensor images which are to be linked to navigation files.

PROGRAM DESCRIPTION

ARLINK TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location of aircraft image(s)
NAVNO	Navigation dataset number

DIRLOC is the disk/directory location of the aircraft sensor images to which navigation datasets are to be linked.

NAVNO is the aircraft navigation dataset number of the navigation file to which the selected images will be linked. For example, to link the images to navigation file A0003.ANV, specify NAVNO = 3. If NAVNUL is the null value, the navigation dataset number will be obtained from the aircraft image label. The number in the image label corresponds to the aircraft dataset number. Under normal circumstances the number obtained from the image label should be used. NAVNO should only be specified when many aircraft datasets correspond to one navigation dataset. For example, to save space, only one navigation dataset is ingested for a flight line, but there could be many datasets (e.g., different MCR channels) corresponding to that flight line.

PROGRAM EDTAHDR

Edit Aircraft Dataset Header Information

FUNCTIONAL DESCRIPTION

EDTAHDR edits selected aircraft dataset header information. The current values of the fields which can be edited are displayed by a dynamic tutor. Both the aircraft dataset and directory are updated accordingly.

PROGRAM DESCRIPTION

EDTAHDR TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location of dataset header to be edited

DIRLOC specifies the disk/directory location of the aircraft dataset for which selected header information will be edited.

AIRCRAFT HEADER EDIT PARAMETERS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
AIRCRAFT	Aircraft name (4 char max)
MISSION	Mission number (2 char max)
FLINENO	Flight line number (2 char max)
DESCRIP	Dataset description (48 char max)

AIRCRAFT is the name of the aircraft from which the datasets were collected. Valid names are "ER2", "U2", and "C990".

MISSION is the mission number of the experiment from which the datasets were collected, and may be 2 characters in length.

FLINENO is the flight line number of the dataset, and may be

2 characters in length.

DESCRIP is a user-specified description of the aircraft dataset. This description is used in the aircraft dataset directory.

The AIRCRAFT HEADER EDIT PARAMETERS DYNAMIC TUTOR lists the current values for the aircraft dataset parameters which can be edited. These header parameters are stored in the image label.

PROGRAM LISAHDR

List Aircraft Header Information

FUNCTIONAL DESCRIPTION

LISAHDR displays aircraft dataset directory header information. First, a list of all the datasets in the aircraft directory is displayed. Detailed information about any dataset is then available by typing 'HELP (reference #)'. Once a dataset is selected, a list of all the sensor "channels" in the dataset is displayed. Detailed information about a "channel" is available by typing 'HELP (reference #)'. The term "channel" refers to the identification number of the sensor channel, and not its actual channel assignment. Consult the detailed HELP information for specific frequency or wavelength identification.

PROGRAM DESCRIPTION

LISAHDR TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location of aircraft dataset(s)

DIRLOC specifies the disk/directory location of the aircraft directory of interest.

PROGRAM MRKCHN

Mark Aircraft Channel for Deletion

FUNCTIONAL DESCRIPTION

MRKCHN marks an aircraft "channel" for deletion. The "channel" will not actually be deleted. The "channel" may be recovered via RECCHN. Since a procedure to compress the aircraft datasets is not currently available, this proc is of limited value.

PROGRAM DESCRIPTION

MRKCHN TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location

DIRLOC specifies the disk/directory location of the aircraft dataset of interest.

PROGRAM RECCHN

Recover an Aircraft Channel from Deletion

FUNCTIONAL DESCRIPTION

RECCHN recovers an aircraft "channel" which has been marked for deletion with MRKCHN, provided that the aircraft dataset has not been compressed. (Currently, no procedure to compress aircraft datasets exists. Thus, this proc is of limited usefulness.)

PROGRAM DESCRIPTION

RECCHN TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location

DIRLOC specifies the disk/directory location of the aircraft dataset of interest.

CHAPTER 5

AOIPS UTILITIES

5.1 Image File Location Utilities

PROGRAM CREATGRP

Create AOIPS Group Area for Images

FUNCTIONAL DESCRIPTION

CREATGRP creates a new AOIPS group area for images. The name of the new group must be specified. If no disk name is given, the group will be created on the default disk.

PROGRAM DESCRIPTION

CREATGRP TUTOR

PARAMETER -----	DESCRIPTION -----
ORIGIN	Default origin for new group (informational)
GROUP	New group name
DISK	Disk for new group directory

ORIGIN is the default origin for the new group. This is informational only.

GROUP must be a valid subdirectory name under the AOIPS group structure for the host operating system. The maximum

length of this parameter is restricted to 9 characters. This value will be used to create a directory in the following form: DISK:[F\$USER.F\$STRNM.GROUP]

DISK is the disk name where the new group directory is to reside. The maximum length of the disk name is currently 15 characters. If no disk name is specified, the current disk is used.

PROGRAM GETGROUP

Set New Current Group Location for AOIPS

FUNCTIONAL DESCRIPTION

GETGROUP changes the AOIPS group location. This process is part of the AOIPS File Location System mechanism. Refer to the AOIPS File Location System documentation for more information.

PROGRAM DESCRIPTION

GETGROUP TUTOR

PARAMETER -----	DESCRIPTION -----
GROUP	New group location
DISK	New disk location
NODE	New node location

GROUP is the new current group directory to be used to access AOIPS image files. The values of global variable F\$FILLOC will be changed to specify the new group directory. This parameter is limited to 9 characters.

DISK is the disk on which the desired group directory resides. This parameter is limited to 15 characters.

NODE is the current node on which the desired disk is mounted. This parameter is limited to 15 characters.

PROGRAM SETFLOC

Set New Host Directory Specification

FUNCTIONAL DESCRIPTION

SETFLOC changes the location for files that will be accessed by applications programs. A fully qualified host system directory specification must be specified. If the supplied directory is valid, the AOIPS File Location System global variables will be updated properly to point to the new directory. This mechanism should be used to change directories for TAE files as opposed to using a TAE DCL SET DEFAULT command. Refer to the AOIPS File Location System documentation for more complete information.

PROGRAM DESCRIPTION

SETFLOC TUTOR

PARAMETER	DESCRIPTION
-----	-----
HDSPEC	New host directory specification

HDSPEC must be a valid host directory specification. It is limited to a maximum length of 80 characters. The specification may contain a new node name, a new disk name, and/or a new user name complete with two subdirectories. Normally, the first subdirectory is always AOIPS and the second subdirectory is the name of the group containing the AOIPS system directory files. Each subdirectory name is limited to a maximum size of 9 characters. SETFLOC attempts to access the specified directory to verify that the user has access rights to it.

PROGRAM WHEREAMI

Display Current AOIPS File Location System Global Parameters

FUNCTIONAL DESCRIPTION

WHEREAMI displays the current AOIPS File Location System global variable values, allowing the verification of the settings at any time during a work session.

5.2 AOIPS Conversion Utilities

PROGRAM CNVNAV

Convert Old Landmark/Navigation Files to Current AOIPS Format

FUNCTIONAL DESCRIPTION

CNVNAV converts an old AOIPS navigation/landmark file set (TE55,TE58,TE66, and NAV2) into the new VAP navigation/landmark file format.

PROGRAM DESCRIPTION

CNVNAV TUTOR

PARAMETER	DESCRIPTION
-----	-----
INSTRU	Navigation/landmark instrument
NAVDES	Navigation file description
STEREO	Stereo navigation flag
	0 - no stereo 1 - yes
SINSTRU	Stereo navigation instrument
SNAVDES	Stereo navigation file description

INSTRU is the instrument name corresponding to the navigation/landmark data. It forms the first part of the output file names for the converted navigation and landmark files. Valid instrument names are: (EVISSR,WVISSR,GMS,SMS)

NAVDES is a description of the navigation file which is entered in the navigation directory file. A free text description up to 128 characters may be entered.

STEREO is used to indicate if a stereo navigation file (NAV2.DAT) exists corresponding to this navigation/landmark file set.

0 - NO stereo 1 - YES stereo

SINSTRU is the instrument name corresponding to the stereo navigation data. It forms the file name for the converted file. The stereo file name uses the same number as the navigation/landmark files, therefore, the instrument name for the stereo navigation must be different from the navigation/landmark instrument name.

SNAVDES is a description of the stereo navigation file which is entered in the stereo navigation directory file. A free text description up to 128 characters may be entered.

PROGRAM CNVLDC

Convert old Line Documentation Files to current AOIPS Format

FUNCTIONAL DESCRIPTION

This program converts line documentation files from the PDP 11/70 based system to the VAX 11/780 based AOIPS format.
The files converted are as follows:

Description	Old file name	New file name
-----	-----	-----
master label file	TE56.DAT	instru.MLF
chebyshev file	TE67.DAT	instru.CHB

PROGRAM DESCRIPTION

CNVLDC TUTOR

PARAMETER	DESCRIPTION
-----	-----
INSTRU	Instrument data source. Valid values are: EVISSR, WVISSR, GMS
DIRECT	Directory location for converted files
REPLACE	Indicates if existing files are to be replaced

INSTRU is the instrument data source. The valid sources are EVISSR, WVISSR, and GMS.

DIRECT is the AOIPS Group location for the converted files.

REPLACE is a flag to indicate whether existing files are to be replaced.

PROGRAM CNVUIC

Convert Data Files from AOIPS to new AOIPS Format

FUNCTIONAL DESCRIPTION

CNVUIC converts an AOIPS files into the current AOIPS format.

PROGRAM DESCRIPTION

CNVUIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
NAVFLG	Navigation files flag
INSTRU	Navigation/landmark instrument
DESNV	Navigation file description
STEREO	Stereo navigation flag
SINSTRU	Stereo navigation instrument
SNAVDES	Stereo navigation file description
REPLACE	Replace line documentation files if they already exist

NAVFLG is a flag used to determine if the navigation/landmark files exist in this UIC. If YES navigation/landmark files are converted before image files. If NO, INSTRU must still be given for the line documentation file conversion.

INSTRU is the instrument name corresponding to the navigation, landmark, and line documentation data. It forms the first part of the output file names for the converted navigation, landmark, and line documentation files.

Valid instrument names are: (EVISSR,WVISSR,GMS)

DESNV is a description of the navigation file which is entered in the navigation directory file. A free text description up to 128 characters may be entered. If NO navigation is present anything may be entered to execute the program.

STEREO is a flag used to indicate if a stereo navigation file (NAV2.DAT) exists corresponding to this navigation/landmark file set.

SINSTRU is the instrument name corresponding to the stereo navigation data. It forms the file name for the converted file. The stereo file name uses the same number as the navigation/landmark files, therefore, the instrument name for the stereo navigation must be different from the navigation/landmark instrument name.

SNAVDES is a description of the stereo navigation file which is entered in the stereo navigation directory file. A free text description up to 128 characters may be entered.

REPLACE allows the user to replace existing line documentation files even if they already exist.

5.3 Button Board Utility

PROGRAM BB

Button Board Utility

FUNCTIONAL DESCRIPTION

BB invokes the image manipulation Button Board utility. This program utilizes the keyboard of the CRT to implement a variety of image manipulation functions. Each key of the CRT represents an AOIPS utility program or function.

The BB utility allows the user to have highly interactive control of image enhancement and manipulation functions.

PROGRAM DESCRIPTION

BB TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Disk/Directory

INGROUP is the disk/directory location that will be used if the user drops images to the IAT from within the Button Board.

Write DMS Annotation String to Graphics Plane DYNAMIC TUTOR

PARAMETER	DESCRIPTION
-----	-----
LOC	Start location for annotation (pixel,line)
STRING	Annotation string
SIZE	Height of characters
VSKEW	Slant angle from North
HSKEW	Slant angle from East
VSPACE	Vertical spacing
HSPACE	Horizontal spacing
ASPECT	Aspect ratio of characters <1=fat, >1=tall
WRTMOD	Write mode flag 0=normal, 1=additive

LOC is the start location (pixel,line) for the annotation. The upper left corner of the first letter of the string will be at this pixel,line location.

STRING is the string to be annotated, enclosed in double quotes if there are blank spaces between the characters. It can have a maximum value of 80 characters.

SIZE is the height of the characters in pixel units.

VSKEW is the slant angle in degrees from North for the characters. This parameter can be changed in concert with **HSKEW** to produce annotation which is vertical, upside-down, or at any angle of rotation. The user is advised to experiment with the **VSKEW** and **HSKEW** parameters to develop the optimum values for the desired application.

HSKEW is the slant angle in degrees from East for the characters. This parameter can be changed in concert with **VSKEW** to produce annotation which is vertical, upside-down, or at any angle of rotation. The user is advised to experiment with the **VSKEW** and **HSKEW** parameters to develop the optimum values for the desired application.

VSPACE controls the vertical spacing of the annotation string.

HSPACE controls the horizontal spacing between characters of the annotation string.

ASPECT is the aspect ratio of characters. Values greater than 1 produce "tall" characters; values less than 1 produce "fat" characters. The user is advised to experiment with this parameter to achieve the desired result.

WRTMOD is a flag to set whether the write mode will be normal or additive.

BBANNOT is the dynamic tutor in the Button Board used for writing an annotation string (i.e., text, numbers, and symbols entered by the user from the keyboard) to a graphics plane using the Display Management Subsystem (DMS) annotation package.

The annotation string length is limited to 80 characters. Because the size of the characters and the spacing between them will affect the number of characters which can be written onto the 512 pixels available across a line, the user should be prudent in the selection of such parameters to ensure that the string will fit in the desired location.

BBANNOT is invoked in the Button Board by the <KP 0> key.

EDIT CURSOR PARAMETERS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
WDWBOX	Start position and size of graphics box
GPLANE	Graphics bit plane number for box (info only)
BCOLOR	Box color
CCOLOR	Cursor color
POSITION	Cursor coordinates (x,y)
FORM	Cursor form (ARROW, BOX, CROSS, DIAMOND, ELLIPSE, STAR, X)
RATE	Cursor blink rate (STEADY, SLOW, MED, FAST)
SIZE	Cursor size (1-64, 1-64)

WDWBOX is the start position and size of the graphics box. It is a four-parameter field specified as follows:

WDWBOX(1) - start line
WDWBOX(2) - start pixel
WDWBOX(3) - number of lines
WDWBOX(4) - number of pixels

GPLANE is the graphics plane to which the box will be written. The only valid graphics plane for the box is plane # 7.

BCOLOR is the color of the box. Valid values are:
"RED", "MAROON", "MAGENTA", "PINK", "DK BLUE", "BLUE GR",
"LT BLUE", "DK GREEN", "MED GRE", "LT GREEN", "OLIVE",
"BROWN", "TAN", "SAND", "BLACK", "GRAY", "WHITE", "YELLOW",
"ORANGE", and "PURPLE". The default is "YELLOW".

CCOLOR is the color of the cursor. Valid values are:
"RED", "MAROON", "MAGENTA", "PINK", "DK BLUE", "BLUE GR",
"LT BLUE", "DK GREEN", "MED GRE", "LT GREEN", "OLIVE",
"BROWN", "TAN", "SAND", "BLACK", "GRAY", "WHITE", "YELLOW",
"ORANGE", and "PURPLE". The default is "RED".

POSITION is a two-parameter field which specifies the
cursor coordinates by screen pixel and line number.
The default is 256,256.

FORM is the shape of the cursor. Valid shapes are:
"ARROW", "BOX", "CROSS", "DIAMOND", "ELLIPSE", "STAR", and "X".
The default is "CROSS".

RATE is the blink rate of the cursor. Valid values are:
"STEADY", "SLOW", "MED" and "FAST". The default is
"STEADY".

SIZE is the size of the cursor in horizontal (pixels)
and vertical (lines) dimensions. The maximum size of
the cursor is 64 x 64. The default is 9 x 9.

BBECUR defines and specifies the type, form, color,
blink rate, size, and screen position of the cursor; and the
graphics bit plane number and size of the graphics box.

BBECUR is invoked in the Button Board by using <linefeed>.

PARAMETER -----	DESCRIPTION -----
MODE	Cursor control mode (TRACKBALL, ARROW_KEY)
VALUECUR	Grey value for writing cursor
ANDVALUE	Grey value for engraving graphics
TYPEHST	Histogram type (NORMAL, UP_CUMULATIVE, DOWN_CUMULATIVE, BI-DIMENSIONAL)
UPPERHST	Upper bound(s) for histogram
HSTLOWER	Lower bound(s) for histogram
BINSIZE	Bin size(s) for histogram
CLRSlice	Level slice color (RED, GREEN-default, BLUE)
DELTA	Delta for single slice width (0 - 127)
LOOPDEL	Loop delay between images (tenths of seconds)
DIRLOOP	Loop direction (FORWARD, BACKWARD, BIDIRECT)
ZOOM	Zooming method (REPLICATION, BILINEAR, CUBIC)

MODE specifies the manner in which the cursor and box are to be manipulated. The default value is "TRACKBALL", which means that the cursor/box will be moved or shaped by the IIS trackball. "ARROW_KEY" will allow the cursor/box to be manipulated using the arrow keys on the user's CRT.

VALUECUR is the grey value at which the cursor will be written to an image when the Button Board Write Cursor (W) function is invoked.

ANDVALUE is the grey value at which active graphics will be written to an image when the Button Board Andgate (A) function is invoked.

TYPEHST is the type of histogram to be calculated by the histogram function (H key). Valid values are: "NORMAL" (default), "UP_CUMULATIVE", "DOWN_CUMULATIVE" or "BI-DIMENSIONAL".

UPPERHST is the upper bound in grey value for the histogram. Specify both UPPERHST(1) and UPPERHST(2) if calculating a "BI-DIMENSIONAL" histogram.

HSTLOWER is the lower bound in grey value for the histogram.

Specify both HSTLOWER(1) and HSTLOWER(2) if calculating a "BI-DIMENSIONAL" histogram.

BINSIZE is the bin size of the histogram. Specify both BINSIZE(1) and BINSIZE(2) if calculating a "BI-DIMENSIONAL" histogram.

CLRSlice is the color to be used for level slicing. Valid values are "RED", "GREEN" (default), or "BLUE".

DELTA is the delta width for the single slice, computed as follows:

$$\text{Width} = \text{Grey value} \pm \text{DELTA}$$

Valid values range from 0 to 127. The default value of zero specifies that the single slice will be stepped through every grey value by trackball control.

LOOPDEL specifies the delay (in tenths of seconds) between successive images. This defines the loop speed.

** LOOPDEL cannot be edited while a loop is in progress. **

DIRLOOP is the direction that the loop will go when activated. Valid values are:

FORWARD	first image to last image, then first image
BACKWARD	last image to first image, then last image
BIDIRECT	first image to last image, then last to first

** DIRLOOP cannot be edited while a loop is in progress. **

ZOOM is the zooming method for the Button Board image zoom. Valid values are: "REPLICATION", "BILINEAR" and "CUBIC".

BPARAM allows the user to edit a variety of Button Board parameters. Cursor control can be either via the IIS trackball (default) or the arrow keys on the CRT. Grey values for writing the cursor or annotation can be changed, as well as histogram bounds for the Button Board Histogram function and the width of the single slice for the Level Slice function.

Four loop speeds, specified as the delay in tenths of seconds between images, can be set. The loop speed or direction cannot be changed while a loop is in progress. Stop a loop with the PF4 key before editing the loop parameters.

PROGRAM BBDEMO

Button Board Demonstration Program

FUNCTIONAL DESCRIPTION

BBDEMO invokes the Button Board utility, with the option of specifying a TAE SCRIPT file to be read. This version of the Button Board is useful for providing demonstrations of the BB utilities in a non-interactive mode.

PROGRAM DESCRIPTION

BBDEMO TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Disk/Directory
INFILE	Instruction file

INGROUP is the disk/directory that will be used if the user drops images to IAT from within the button board.

INFILE is the name of the instruction file to be read for the button board. This parameter allows the use of TAE SCRIPT files to demonstrate the button board functions.

The following gives a brief description of each Button Board key. Note that the key is enclosed by angle brackets.

⟨UP⟩ : Cursor Control

This key moves the IAT cursor upward.

⟨DOWN⟩ : Cursor Control

This key moves the IAT cursor downward.

⟨RGHT⟩ : Cursor Control

This key moves the IAT cursor to the right.

⟨LEFT⟩ : Cursor Control

This key moves the IAT cursor to the left.

⟨BKSP⟩ : Toggle Active LUT

This key toggles the active look-up table (LUT) for the active refresh memory. (Primary LUT to Secondary LUT or vice versa)

⟨TAB⟩ : Cursor Speed

This key adjusts the cursor speed for each interrupt from the arrow keys. The initial speed is 10 pixels per interrupt. Each time the TAB key is pressed, the speed toggles between 1 pixel per interrupt and 10 pixels per interrupt.

⟨LINEFEED⟩ : Edit Cursor Parameters

This key invokes a dynamic tutor that allows the user to change the global cursor and box parameters. These parameters define cursor characteristics (shape, color, blink rate, size, and position) and box characteristics (size, position, color).

⟨CR⟩ :

This key displays the primary button board information when the user is in the primary button board, and the configuration information when the user is in the secondary (configuration) button board.

⟨KP ,⟩ :

This key clears all active bit planes. Bit planes not active are not affected. It is used in both the primary and configuration button boards.

⟨KP -⟩ :

This key clears and resets all bit planes (whether active or not). It is used in both the primary and configuration button boards.

⟨KP .⟩ :

This key sets the active bit planes to a user-specified color. Select the color by entering the one-letter code for

the desired color. This key is used in both the primary and configuration button boards.

<KP 0> :

This key invokes a dynamic tutor for annotating a character string onto the active bit planes. Characters may be as large as 512 pixels in height, providing that the proper combination of aspect ratio and string length are used. The start location of the string will be the upper-left portion of the first character. This key is used in both the primary and configuration button boards.

<KP 1> - <KP 7> :

These keys toggle bit planes 1 - 7 on/off. Bit planes turned on are added to the list of active planes used for graphics operations (e.g., andgate). These keys are used in both the primary and configuration button boards.

<KP 8> :

This key toggles all bit planes on/off. Bit planes turned on are added to the list of active planes used for graphics operations (e.g., andgate). This key is used in both the primary and configuration button boards.

<KP 9> :

This key unshifts all the bit planes. The use of the graphics box unshifts and unzooms all bit planes. Only one shift amount is possible for all bit planes. This key is used in both the primary and configuration button boards.

<PF 1> : Look-up Table Edit

This key allows the user to edit/create a look-up table (LUT). The new look-up table cannot be catalogued unless the file location directory (F\$FILLLOC) is owned by the user. This function is only available in the "stand alone" button board. If the button board is entered from another program, this function is not available.

<PF 2> : Zoom Bit Planes

This key zooms the bit planes, using either the trackball or arrow keys, depending upon the operational mode. The zoom method (replication, bilinear, or cubic) is defined using the "Edit PDF Parameters" function (P key). This key is used in both the primary and configuration button boards.

<PF 3> : Shift Bit Planes

This key shifts the bit planes, using either the trackball or arrow keys, depending upon the operational mode. This key is used in both the primary and configuration button boards.

<PF 4> : Stop Loop

This key stops the current loop sequence. The image or configuration currently viewed will be indicated by the 'current display' on the status display.

<SP> :
This key refreshes the button board status displays.

<">, <'> : Reset Graphics Box Size
This key resets the size of the graphics box to its default size of 16 lines by 16 pixels. The location of the upper-left-hand corner of the box does not change.

<,>, <<> : Slice Low
This key enables the grey level slice function. The active LUT will be replaced by a sequential LUT. The slice is controlled by the trackball or arrow keys, depending upon the operational mode. The low slice edits the sequential LUT from the low end, (i.e., the range of values zeroed is (0,n) where n ranges from 0 to 255). After the low slice is completed, the new (sliced) LUT becomes the active LUT.

<>>, <.> : Slice High
This key enables the grey level slice function. The active LUT will be replaced by a sequential LUT. The slice is controlled by the trackball or arrow keys, depending upon the operational mode. The high slice edits the sequential LUT from the high end, (i.e., the range of values zeroed is (n,255) where n ranges from 255 to 0). After the low slice is completed, the new (sliced) LUT becomes the active LUT.

</> : Slice Single
This key enables the grey level slice function. The active LUT will be replaced by a sequential LUT. The slice is controlled by the trackball or arrow keys, depending upon the operational mode. The slice edits the sequential LUT by replacing the grey value n with 0. The value n can range from 0 to 255. The default width of delta-n is set to 0, meaning that the slice is for a single grey level. Use the "Edit PDF Parameters" function key (P) to change the delta value, enabling the slice to be over a constant "delta width" of grey values. After the low slice is completed, the new (sliced) LUT becomes the active LUT.

<1> - <=> :
These keys activate refresh memory #1 - # 12. Refresh memories must be activated before they can be used in other button board functions. These keys are used in both the primary and configuration button boards.

<|> : shift <1> - shift <=>
These keys cause saved configuration #1 - 12 to be viewed. The active refresh memory is not changed by these functions. These keys are used in both the primary and the configuration button boards.

<:;>, <;> Reset Cursor Coordinates
This key resets the cursor to the center of the screen (i.e., 256,256).

<?> :

This key prompts the user for the function key for which detailed help is to be displayed.

<[>, <{> : Copy Memory

This key copies the image in the previous active refresh memory and its associated label to the active refresh memory.

<]>, <}> : Copy Look-Up Table

This key copies the Primary and Secondary LUTs in the previous active refresh memory to the active refresh memory.

<'>, <~> : Input Active Refresh Memory Number

This key prompts the user for the number of the refresh memory to be activated. This provides a way to set refresh memories greater than twelve (12) as the active refresh memory.

<A>, <a> : Andgate (Engrave)

This key engraves the graphics on the active bit planes onto the active refresh memory using the current value of the input parameter ANDVALUE. Any shifts of images or graphics will be taken into account. ANDVALUE may be changed by using the "Edit PDF Parameters" function (P key).

, : Zero Image

This key clears the image and graphics data in the active refresh memory. The refresh memory must be unlocked in order for it to be cleared. The image label will remain in the image selection list.

<C>, <c> : Configure

This key invokes the secondary button board for dynamic configuration of images. Active memory keys, view keys, and keypad keys for graphics plane control are all valid in the configuration keyboard. This configuration button board allows refresh memories to be viewed through the selected gun (red, green, blue) with the appropriate segment of the selected lookup table. The LUT of the active refresh memory can be toggled.

<D>, <d> : Drop Image

This key displays the image selection list (using the current group location) for the selection of disk image files to drop to specified refresh memories.

<E>, <e> : Exit

This key exits the Button Board utility and returns control to TAE.

<F>, <f> : Fade

This key enables the fade function between two images. The two images to fade between are the last two memories

specified, i.e., the active memory and the previous active memory. Control of the fade function is done by the x direction of motion of the trackball. If the cursor is at the left of the screen, 100 % of the active memory is displayed on the IAT and 0 % of the previous active memory is displayed. As the cursor is moved toward the right, an increasing amount of the previous active memory fades into view and a proportionate amount of the active memory fades from view. When the cursor is all the way to the right, the active memory is completely faded out and replaced by the previous active memory. Exiting from the fade function is accomplished by pressing any trackball button. The current display is restored upon exiting.

<G>, <g> : Grey

This key displays grey values for the image in active refresh memory. The user moves the graphics box with the trackball or arrow keys, depending upon the operational mode. The maximum size of the graphics box for grey level display is 16 lines by 16 pixels.

<H>, <h> : Histogram

This key computes and displays a histogram of the grey values of the image in active refresh memory. (If the bi-dimensional histogram option is used, grey values on two images will be calculated and displayed, along with the regression line of best fit.) The area for computation is defined by a box or polygon. The user must first use the "Move/Shape Box" (M or X keys) or "Polygon" (Y key) keys to define the area before invoking the histogram calculation. Histograms can be displayed at the CRT (default) or directed to the line printer. The histogram type is defined by the parameter TYPEHST in the "Edit PDF Parameters" function (P key). The upper and lower bounds and bin size for the histogram are also defined by this function.

<I>, <i> : Set Loop Sequence

This key displays the image/configuration selection list for the selection of refresh memories/configurations to be defined for a loop sequence. Additionally, memories or configurations can be viewed, deleted or have their protection toggled (LOCK/UNLOCK). Detailed information for each image is also available.

<J>, <j> : Profile

This key allows the user to determine grey values along a specified line. Field values (i.e., temperature, reflectivity, etc.) are also displayed for aircraft, radar, and satellite images. Results can be printed to a print file and/or plotted to a graphics device.

<K>, <k> : Perform Four-image Mosaic Loop

This key loops selected images one quadrant at a time in a mosaic loop. Loop direction and speed can be modified by the

"Edit PDF Parameters" function (P key).

<L>, <l> : Loop

This key loops refresh memories/configurations defined by the "Set Loop Sequence" function (I key). Four speeds are defined for this asynchronous loop, and can be toggled by successively depressing the loop key. The loop is stopped by pressing the <PF4> key. During the loop, the 'current display' value on the status display will not be updated, but when the loop is stopped, this value will be set to what is currently being viewed. The loop direction and speed parameters are modified by the "Edit PDF Parameters" function (P key). These parameters cannot be modified when a loop is in progress.

<M>, <m> : Move Cursor / Box

This key moves the graphics box using the trackball or arrow keys, depending upon the operational mode. The box cannot wrap around the edge of the screen.

<N>, <n> : Manual Loop

This key steps through the loop defined by the "Set Loop Sequence" (I key) one image at a time. The next image is displayed each time this key is depressed.

<O>, <o> : Cursor On/Off

This key toggles the cursor on/off.

<P>, <p> : Edit Control Parameters

This key displays the TAE dynamic tutor for editing button board control parameters. After the dynamic tutor is executed, the button board status display will reappear.

<Q>, <q> : Load Sequential Look-Up Table (LUT)

This key loads the active refresh memory with a sequential LUT (0-255). The replaced LUT cannot be recovered.

<R>, <r> : Statistics

This key generates the following image statistics for a defined region: mean, mode, standard deviation, minimum value, and maximum value. The statistics are given in terms of both grey value and field value (temperature, reflectivity, etc.). The area for computation is defined by a box or polygon. The user must first use the "Move/Shape Box" (M or X keys) or "Polygon" (Y key) keys to define the area before invoking the statistics calculation. Statistics can be displayed at the CRT (default) or directed to the line printer.

<S>, <s> : Shift Image

This key shifts the image in the active refresh memory using the trackball or arrow keys, depending upon the operational mode. Movement of the cursor reflecting the movement of the image will be viewed if the cursor is active. The cursor is

restored to its original position after shifting is complete

⟨T⟩, ⟨t⟩ : Toggle Protection

This key toggles the protection of the active refresh memory. Refresh memories that are "LOCKED" cannot be zeroed (B Key).

⟨U⟩, ⟨u⟩ : Unshift Image

This key resets the shift of the image in active refresh memory to zero. If the image has been zoomed, the zoom shift will remain.

⟨V⟩, ⟨v⟩ : View

This key causes the active refresh memory to be viewed on the IAT device.

⟨W⟩, ⟨w⟩ : Write Cursor

This key writes a cursor onto the image in the active refresh memory. The size and form of the cursor are defined by the "Edit Cursor Parameters" function (⟨linefeed⟩ key). The grey value at which the cursor is written is defined by the parameter VALUECUR in the "Edit PDF Parameters" function (P key).

⟨X⟩, ⟨x⟩ : Shape Box

This key shapes the graphics box using the trackball or arrow keys, depending upon the operational mode. The size of the box increases as the trackball (arrow keys) is moved to the right (up) and decreases when the trackball is moved to the left (down). The box size does not change when the box reaches the edge of the screen.

⟨Y⟩, ⟨y⟩ : Polygon

This key draws a polygon to be used to define a region for histogram (H key) or statistics (R key) computations. The user must close and fill the region in order for the histogram and statistics functions to work properly.

⟨Z⟩, ⟨z⟩ : Zoom (Unzoom)

This key zooms the image in the active refresh memory by a factor of 2, 4, 8, or 1, respectively. The cursor position defines the center around which the image will be zoomed.

5.4 Database Management Utilities

PROGRAM CRCATLG

Catalog Image Files

FUNCTIONAL DESCRIPTION

CRCATLG creates an AOIPS image catalog file (DIR.IMG) and catalogs images in the AOIPS group.

PROGRAM DESCRIPTION

CRCATLG TUTOR

PARAMETER	DESCRIPTION
-----	-----
DISDIR	Disk/directory for images
FILENAM	Name of image file to catalog (null= catalog all image files)
PROC	Name of process which generated image
MAP	Remapping type
DESCRIP	Image description

DISDIR is the disk/directory location where the images are to be cataloged.

FILENAM is the name of the image to be cataloged. A null value will catalog all images of type .IMG in the group DISDIR.

PROC specifies what program created the image. This parameter is purely informational for the catalog.

MAP specifies the image remapping type (e.g., PPI, AIR). This parameter is purely informational for the catalog.

DESCRIP is a description for the image. This parameter is purely informational for the catalog.

PROGRAM IDDELETE

Delete Images From Group

FUNCTIONAL DESCRIPTION

IDDELETE deletes selected images from the default image group. If the user owns the specified images, they are deleted from disk, along with the directory entries referring to them. If the user does not own an image (i.e., it is shared), only the directory entry is deleted.

PROGRAM IDLIST

Image Directory Display/Print Function

FUNCTIONAL DESCRIPTION

IDLIST displays a list of images for a specified directory on the CRT screen. A more detailed list may be output to the printer.

PROGRAM DESCRIPTION

IDLIST TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Image group location
DEVICE	Output device (TERMINAL, PRINTER)

INGROUP is the disk/directory location for which an image directory listing is desired. The default value is the current TAE global parameter, F\$FILLLOC.

DEVICE specifies where the image directory listing should be output. Valid values are "TERMINAL" or "PRINTER". The default value of "TERMINAL" will direct the listing to the user's CRT.

The default value of "PRINTER" is that specified by the global variable F\$PRINT. This variable can be modified by using the PRINTER program.

PROGRAM IMGLNK

Set Image Links

FUNCTIONAL DESCRIPTION

The purpose of this program is to establish image links. The type of image links currently available are STEREO where a link between the stereo base and its corresponding remapped image is set, VIIR where a visible and an IR image are linked, or COLOR where a link is established between three images.

PROGRAM DESCRIPTION

IMGLNK TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Input Image Group
LINKTYPE	Image Link Type (Stereo, VIIR, Color)
IMGNUM	Image Numbers to be linked (Zero produces list)

INGROUP is the name of the image group where the image files are located. The current image group in the TAE global parameter F\$FILLOC is provided as the default. Because of file protection against write, the valid image group name should be normally under the logon user name.

LINKTYPE is the type of the image link. STEREO is to link a base (unremapped) image and its corresponding remapped image. VIIR is to link a visible image and its corresponding IR image. COLOR is to link together three images to produce a true or false color image.

IMGNUM are the image numbers that are going to be linked. These images must have been cataloged in the image group specified as INGROUP. Enter 2 image numbers for either STEREO or VIIR link. Enter 3 image numbers for COLOR link. To examine the image catalog by entering "0", you should select all images from the list.

PROGRAM UICCOPY

Copy AOIPS Group To Another Group

FUNCTIONAL DESCRIPTION

UICCOPY copys a group of files from one group location to another. The destination location must be an empty group directory.

PROGRAM DESCRIPTION

UICCOPY TUTOR

PARAMETER -----	DESCRIPTION -----
DEST	Destination group location (must be empty)
ORIGIN	Source group location

DEST is the destination group for the files to be copied. This destination group must be an empty directory.

ORIGIN is the group from which the files are to be copied.

5.5 File Edit Utilities

PROGRAM DIREDT

Edit Image Directory File via Structured Variable Editor

FUNCTIONAL DESCRIPTION

DIREDT invokes the Structured Variable File Editor to edit the AOIPS/2 image directory file.

PROGRAM DESCRIPTION

DIREDT TUTOR

PARAMETER -----	DESCRIPTION -----
INFILE	Name of file to edit
OUTFILE	Name of new (edited) file (default - SAME)
DIRECT	Host directory location
TYPE	File organization type (DIRORG only)

INFILE is the name of the file to be edited, not including the host directory specification.

OUTFILE is the name of the newly created (edited) output file not including the host directory specification. Use "SAME" to cause the new file to have the same name as the old file. The new file is always created in the same host directory as the original file. If "SAME" is used, the new file will be of a higher version; purge old files using the DCL PURGE command.

DIRECT is the host operating system directory location containing the file to be edited.

TYPE defines the organization of the file to be edited. The procedure only allows editing of AOIPS/2 Image Directory files. "DIRORG" is the only valid value.

PROGRAM LBLEDT

Edit Image Label Information

FUNCTIONAL DESCRIPTION

LBLEDT enables editing of selected image label information. A non-TAE image menu will be presented that allows selection of the image label to be edited. Fields that can be edited are then displayed with their current values via a dynamic tutor.

PROGRAM DESCRIPTION

LBLEDT TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location

DIRLOC specifies the disk/ directory of the image directory for images whose labels are to be edited.

EDIT IMAGE LABEL DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
SHORTD	Image short description (8 characters max)
DESC	Image description (48 characters max)
VOLUME	Disk volume label (12 characters max)

SHORTD is a short description of the selected image. This description is stored in the image directory and may be a maximum of 8 characters.

DESC is a long description of the selected image. This description is stored in the image directory and may be a maximum of 48 characters.

VOLUME is the disk volume label of the selected image. An example of a volume label is VAPVMSDT1. The volume label is

stored in the image directory, and may be a maximum of 12 characters in length.

IMBLDYN is a dynamic tutor which displays the fields of the selected image label information that may be edited via LBLEDT. The image directory and/or the image label will be modified to reflect changes made.

PROGRAM IMGEDT

Edit Image File via Structured Variable File Editor

FUNCTIONAL DESCRIPTION

IMGEDT invokes the Structured Variable File Editor to edit AOIPS/2 image files.

PROGRAM DESCRIPTION

IMGEDT TUTOR

PARAMETER -----	DESCRIPTION -----
INFILE	Name of file to edit
OUTFILE	Name of new (edited) file (default - SAME)
DIRECT	Host directory location
TYPE	File organization type (IMGORG only)

INFILE is the name of the file to be edited, not including the host directory specification.

Examples are: DIR.IMG, FILE.TYP;5 .

OUTFILE is the name of the newly created (edited) output file not including the host directory specification. Use "SAME" to cause the new file to have the same name as the old file. The new file is always created in the same host directory as the original file. If "SAME" is used, the new file will be of a higher version; purge old files using the DCL PURGE command.

DIRECT is the host operating system directory location containing the file to be edited.

TYPE is the file organization type, and only permits editing of AOIPS/2 image files. "IMGORG" is the only valid value.

PROGRAM STVEDT

Invoke Structured Variable File Editor Facility

FUNCTIONAL DESCRIPTION

STVEDT invokes the Structured Variable File Editor. The types of files that may be edited and the TYPE name keyword values for these types of file organizations are: AOIPS/2 Image Directory files (DIRORG) and AOIPS/2 Image Data files (IMGORG).

PROGRAM DESCRIPTION

STVEDT TUTOR

PARAMETER -----	DESCRIPTION -----
TYPE	File organization type (DIRORG,IMGORG)
INFILE	Name of file to edit
OUTFILE	Name of new (edited) file (default = SAME)
DIRECT	Host directory location

TYPE defines the organization of the file to be edited. The defined file organization types are:

"DIRORG"	AOIPS/2 Image Directory Files
"IMGORG"	AOIPS/2 Image Data Files

INFILE is the name of the file to be edited, not including the host directory specification.

OUTFILE is the name of the newly created (edited) output file not including the host directory specification. Use "SAME" to cause the new file to have the same name as the old file. The new file is always created in the same host directory as the original file. If "SAME" is used, the new file will be of a higher version; purge old files using the DCL PURGE command.

DIRECT is the host operating system directory location containing the file to be edited.

5.6 Graphics Utilities

PROGRAM ANNOT

Write DMS Annotation String to a Graphics Plane

FUNCTIONAL DESCRIPTION

ANNOT writes an annotation string (i.e., text, numbers, and symbols entered by the user from the keyboard) to a graphics plane using the Display Management Subsystem (DMS) annotation package.

This annotation package is also available in the Button Board. Use of the package through the BB (Keypad 0) provides a more interactive interface with the IAT.

The annotation string length is limited to 80 characters. Because the size of the characters and the spacing between them will affect the number of characters which can be written onto the 512 pixels available across a line, the user should be prudent in the selection of such parameters to ensure that the string will fit in the desired location.

PROGRAM DESCRIPTION

ANNOT TUTOR

PARAMETER	DESCRIPTION
-----	-----
LOC	Start location for annotation (pixel,line)
STRING	Annotation string
SIZE	Height of characters
VSKEW	Slant angle from North
HSKEW	Slant angle from East
PLANE	Graphics bit plane for string
ERASE	Erase plane flag
VSPACE	Vertical spacing
HSPACE	Horizontal spacing
ASPECT	Aspect ratio of characters <1-fat, >1-tall
WRTMOD	Write mode flag 0-normal, 1-additive

LOC is the start location (pixel,line) for the annotation. The upper left corner of the first letter of the string will be at this pixel,line location.

STRING is the string to be annotated, enclosed in double quotes if there are blank spaces between the characters. It can have a maximum value of 80 characters.

SIZE is the height of the characters in pixel units.

VSKEW is the slant angle in degrees from North for the characters. This parameter can be changed in concert with **HSKEW** to produce annotation which is vertical, upside-down, or at any angle of rotation. The user is advised to experiment with the **VSKEW** and **HSKEW** parameters to develop the optimum values for the desired application.

HSKEW is the slant angle in degrees from East for the characters. This parameter can be changed in concert with **VSKEW** to produce annotation which is vertical, upside-down, or at any angle of rotation. The user is advised to experiment with the **VSKEW** and **HSKEW** parameters to develop the optimum values for the desired application.

PLANE is the graphics bit plane (from 1 to 7) on which the annotation string will be written.

ERASE is a flag to set whether the plane specified in **PLANE** should be erased before writing the annotation.

VPSPACE controls the vertical spacing of the annotation string.

HSPACE controls the horizontal spacing between characters of the annotation string.

ASPECT is the aspect ratio of characters. Values greater than 1 produce "tall" characters; values less than 1 produce "fat" characters. The user is advised to experiment with this parameter to achieve the desired result.

WRTMOD is a flag to set whether the write mode will be normal or additive.

PROGRAM ASCCHG

Set AOIPS Global Cursor And Graphics Box Parameters

FUNCTIONAL DESCRIPTION

ASCCHG allows the cursor definition to be changed in terms of its form, color, size, screen position, and blink rate. The graphics box definition may also be changed in terms of its color, screen position, and size.

PROGRAM DESCRIPTION

ASCCHG TUTOR

PARAMETER -----	DESCRIPTION -----
SIZE	Cursor size (1-64,1-64)
RATE	Cursor blink rate (steady,slow,med,fast)
FORM	Cursor form (arrow,box,cross,diamond, ellipse,star,x)
COLOR	Cursor color
POSITION	Cursor position (x,y)
BXCLR	Graphics box color
WINDOW	Start position/size of graphics box
GPLANE	Graphics plane for box

SIZE is the horizontal (number of pixels) and vertical (number of lines) size of the cursor. The maximum size of the cursor is 64.

RATE is the blink rate of the cursor. Valid values are: "STEADY", "SLOW", "MED" and "FAST".

FORM is the shape of the cursor. Valid shapes are: "ARROW", "BOX", "CROSS", "DIAMOND", "ELLIPSE", "STAR", and "X".

COLOR is the color of the cursor. Valid colors are: "RED", "MAROON", "MAGENTA", "PINK", "DK BLUE", "BLUE GR", "LT BLUE", "DK GREEN", "MED GRE", "LT GREEN", "OLIVE", "BROWN", "TAN", "SAND", "BLACK", "GRAY", "WHITE", "YELLOW", "ORANGE", and "PURPLE".

POSITION is a two-parameter field of the coordinates (screen pixel and line numbers) of the cursor.

BXCLR is the color of the graphics box. Valid colors are: "RED", "MAROON", "MAGENTA", "PINK", "DK BLUE", "BLUE GR", "LT BLUE", "DK GREEN", "MED GRE", "LT GREEN", "OLIVE", "BROWN", "TAN", "SAND", "BLACK", "GRAY", "WHITE", "YELLOW", "ORANGE", and "PURPLE".

WINDOW is the box window specification, consisting of starting line, starting pixel, height (in lines), and length (in pixels). The starting pixel and line refer to the upper-left hand corner of the box.

GPLANE is the graphics plane number assigned to the box. The only valid graphics plane for the box is 7.

PROGRAM BPCOLOR

Change Graphics Bit Plane Color

FUNCTIONAL DESCRIPTION

BPCOLOR changes the graphics bit plane color. One of twenty colors may be selected.

PROGRAM DESCRIPTION

BPCOLOR TUTOR

PARAMETER -----	DESCRIPTION -----
PLANE COLOR	Bit plane number Desired color ('DK BLUE', 'MED GRE', MAGENTA, ORANGE, BLACK, 'BLUE GR', 'LT GREEN', MAROON, YELLOW, PINK, 'LT BLUE', OLIVE, RED, GRAY, TAN, DK GREEN, PURPLE, BROWN, WHITE, SAND)

PLANE is the graphics bit plane number whose color is to be set. Valid bit planes are "1" through "7".

COLOR is the desired color of the graphics bit plane. Choose one of the following twenty colors for the selected plane.

DK BLUE	MED GRE	MAGENTA	ORANGE
BLUE GR	LT GREEN	MAROON	YELLOW
PINK	LT BLUE	OLIVE	RED
GRAY	TAN	DK GREEN	PURPLE
BROWN	WHITE	SAND	BLACK

Note that the two-name colors must be enclosed by double quotes when entering the name as a parameter.

PROGRAM BPONOFF

Toggle Graphics Plane On/Off

FUNCTIONAL DESCRIPTION

BPONOFF toggles the specified graphics bit plane on or off.

PROGRAM DESCRIPTION

BPONOFF TUTOR

PARAMETER -----	DESCRIPTION -----
PLANE	Bit plane number (1 to 7)
STATE	Desired state (ON-default, OFF)

PLANE is the number of the graphics bit plane to be toggled on/off. Valid bit planes are 1 through 7.

STATE specifies whether the desired plane is to be turned "ON" or "OFF". The default is "ON".

PROGRAM PUTGRP

Write Test String on All Graphics Planes

FUNCTIONAL DESCRIPTION

PUTGRP writes the string 'PLANE # n' on each of the graphics planes, where n is the bit plane number. This procedure is useful for testing the graphics planes of the image analysis terminal (IAT).

PROGRAM SHIFTGR

Shift All Graphic Planes

FUNCTIONAL DESCRIPTION

SHIFTGR shifts all the graphics planes by the specified pixel and/or line displacement.

Note that in BB (the Button Board Utility), the use of the box will unshift all graphics planes.

PROGRAM DESCRIPTION

SHIFTGR TUTOR

PARAMETER -----	DESCRIPTION -----
XSHIFT	Pixel shift (-512 to 512)
YSHIFT	Line shift (-512 to 512)
SHFTYP	Type of shift (ABSOLUTE or RELATIVE)

XSHIFT indicates how many pixels the graphics planes are to be shifted. Valid values are from -512 to +512. A value of 0 (default) indicates no shift.

YSHIFT indicates how many lines the graphics planes are to be shifted. Valid values are from -512 to +512. A value of 0 (default) indicates no shift.

SHFTYP indicates the type of shift to be applied. An "ABSOLUTE" shift causes the resultant shift of the graphics planes to be equal to the specified values, while a "RELATIVE" shift adds the specified shift values to any shifts which are currently applied to the planes. The default value is "ABSOLUTE".

PROGRAM TXTQRY

Query GEMPLT Text Characteristics

FUNCTIONAL DESCRIPTION

TXTQRY returns the current values of the GEMPLT text characteristics. Use TXTSET to set the values, and TXTWRT to write the annotation string(s).

PROGRAM TXTSET

Set GEMPLT Text Characteristics

FUNCTIONAL DESCRIPTION

TXTSET sets the bit plane color number and text size for GEMPLT characters to be plotted using TXTWRT. The text font number is provided as information only.

PROGRAM DESCRIPTION

TXTSET TUTOR

PARAMETER	DESCRIPTION
-----	-----
COLOR	Graphics bit plane number
RTXSZ	Text size multiplier
ITXFN	Text font number (informational)

COLOR is the graphics bit plane number on which the text will be written. Default bit plane numbers/colors for the IIS are: 1-magenta, 2-red, 3-medium green, 4-yellow, 5-orange, 6-blue, 7-sand (light tan). (The color of the bit plane can further be changed in the Button Board.)

RTXSZ is the multiplier for the size of the characters. Real values from 1.0 to 10.0 are allowed. The distance between characters will be proportionally adjusted.

ITXFN is the text font number. The only valid font number for the IIS device is 1.

PROGRAM TXTWRT

Write GEMPLT Text to a Graphics Bit Plane

FUNCTIONAL DESCRIPTION

TXTWRT writes GEMPLT text to the current graphics bit plane. The graphics plane and size of text characters is set with TXTSET. The first character of the string is centered about the pixel,line location used.

To position the starting location for the text with the IIS trackball, enter the annotation string and use a pixel,line location of 0,0 when executing the procedure.

PROGRAM DESCRIPTION

TXTWRT TUTOR

PARAMETER -----	DESCRIPTION -----
PIXEL	Start pixel (center of 1st char)
LINE	Start line (center of 1st char)
ROTATION	Rotation from X-axis (+ is ccw)
STRING	Annotation text

PIXEL is the pixel location for the center of the first character of the text string. Using a default of 0,0 for the pixel,line location allows the IIS trackball to be used for positioning the start of the string.

LINE is the line location for the center of the first character of the text string. Using a default of 0,0 for the pixel,line location allows the IIS trackball to be used for positioning the start of the string.

ROTATION is the rotation of the string in degrees from the X-axis, with positive rotation as counter-clockwise.

STRING is the text to be written to the graphics bit plane. It may be a maximum of 128 characters.

PROGRAM ZOOMGR

Zoom All Graphic Planes

FUNCTIONAL DESCRIPTION

ZOOMGR zooms (and shifts) all graphics planes. Any shifts applied to the planes before the zoom operation are lost.

PROGRAM DESCRIPTION

ZOOMGR TUTOR

PARAMETER	DESCRIPTION
XCENTER	Center pixel for zoom (1 to 512)
YCENTER	Center line for zoom (1 to 512)
XZOOM	Pixel zoom factor (1,2,4,8,16)
YZOOM	Line zoom factor (1,2,4,8,16)

XCENTER specifies which pixel around which the zoomed grid will be centered. The default value of 256 causes the grid to be centered on the screen.

YCENTER specifies which line around which the zoomed grid will be centered. The default value of 256 causes the grid to be centered on the screen.

XZOOM specifies the pixel zoom factor. Valid values are "1", "2", "4", "8", or "16". The default value of "1" means that the size of the grid in pixels will be its original size.

YZOOM specifies the line zoom factor. Valid values are "1", "2", "4", "8", or "16". The default value of "1" means that the size of the grid in lines will be its original size.

5.7 Image Hard Copy Utilites

PROGRAM GREY

Display/Print Grey Level Values of a Selected Area on an Image

FUNCTIONAL DESCRIPTION

GREY produces a display or printout of a selected area of an image. A translation of the image data to character-valued output for the Versatec printer is also available.

PROGRAM DESCRIPTION

GREY TUTOR

PARAMETER -----	DESCRIPTION -----
REDUCE	Line reduction factor for image map printout (4,8-default,16)
SLEVEL	Pixel intensity level characters (16) for image map printout
OLEVEL	Pixel intensity level overprint characters for image map output

REDUCE controls how many image data lines will be collapsed, or averaged, to produce each character-translated output line. The horizontal reduction factor is fixed at 4, so that there are 128 characters per output line. Valid values for vertical reduction are:

16	yields 32 lines of output
8	yields 64 lines of output (default)
4	yields 128 lines of output (square image)

REDUCE is only used for image character map output. Image character map output is always done on the Versatec printer device.

SLEVEL specifies the characters that will be used to represent the 16 pixel intensity levels in the output character image. This string may be changed to any other desired string of characters to represent the intensities. By utilizing an ordered set of characters for this parameter

and a blank string for the OLEVEL parameter, a direct average intensity level picture may be obtained. This parameter is only used for the image character map output.

OLEVEL specifies the characters that will be overprinted on the corresponding characters in parameter SLEVEL to produce the desired area intensity on the output character image. This string may be changed to any other desired string of characters. The default blank string causes the output to be a direct average intensity level picture based on the characters in the SLEVEL parameter. This parameter is only used for the image character map output.

The following IIS button board will appear after the tutor:

	A	B	C	D	F
3	Select new image	Move box to select new area	Disp. grey values within box	Print grey values within box	Exit
2		Change box shape		Print char. map of image	Help
1					

GREY BUTTON MENU

2B: Change box shape

Changes the shape (size) of the box via the trackball

2D: Print character map of image

Prints a character map of the image

3A: Select new image

Displays image selection list for new image selection

3B: Move box to select new area

Moves box via the trackball

3C: Display grey values within box

Displays grey values (on the CRT) within the graphics box

3D: Print grey values within box

Prints grey values within the graphics box on the
default printer

3F: Exit

Exits the GREY program

GREY uses the AOIPS Global Cursor facility to obtain the initial position of the box. The shape and/or position of the box can be changed at any time. When GREY is exited, the Global Cursor parameters are updated to reflect the last box position.

The "move box" or "shape box" functions are exited by pressing any other function key on the IIS button board to initiate the desired operation (i.e., display values on CRT or print values to the line printer). GREY assumes that the graphics box will be moved again, and automatically puts GREY in "move box" mode.

Press any function button to perform the desired action. Whatever size box is defined, GREY always limits it to at most the upper-left 20 lines and 20 pixels on a CRT or 30 lines and 30 pixels on a printer.

PROGRAM IMGPRT

Print an Image to the QMS Laser Printer

FUNCTIONAL DESCRIPTION

IMGPRT creates a disk file of an image in refresh memory or on disk that can be printed to the QMS laser printer. Up to 8 grey levels are used. The user should apply appropriate LUTs to the image in order to get the best contrast for the output image on the QMS.

The resultant disk file must be explicitly queued to the QMS printer for printing. Files are rather large, and should be deleted from disk after printing.

PROGRAM DESCRIPTION

IMGPRT TUTOR

PARAMETER -----	DESCRIPTION -----
DISDIR	Disk directory/location
PRTNAM	Print file name
IATFLG	Use image in refresh memory? (YES,NO)

DISDIR is the disk directory/location of the image to be printed to the QMS laser printer.

PRTNAM is the name of the print file produced which is in QMS printer format.

IATFLG specifies whether an image from the IAT refresh memory will be printed ("YES"), or whether an image file selected from the disk directory will be printed ("NO").

PROGRAM VCOPY

Transfer Image in Refresh Memory To VERSATEC Plotter

FUNCTIONAL DESCRIPTION

VCOPY copies an image in refresh memory to the Versatec plotter located in the VAP computer room.

PROGRAM DESCRIPTION

VCOPY TUTOR

PARAMETER	DESCRIPTION
IMAGE	Image name
RANGE	Pixel intensity range (LOW VAL, HI VAL) (0-255, 0-255)
QUALITY	Output image quality (LOW-default,HIGH)
TEMPLOC	Spool file location

IMAGE is the name of the image in refresh memory to be copied to the Versatec printer.

RANGE defines the pixel value intensity range to be used to scale the image data. The output image on the Versatec device has 10 intensity levels. The default value maps all possible pixel values into these levels. Making the range of pixel values mapped to these levels more narrow will highlight the image in greater detail. Each value must be between 0 and 255; specify the lower value first. The default value is (0,255).

QUALITY controls the resolution quality and size of the Versatec output image produced. The default value of "LOW" produces a picture 7.5 inches square by utilizing 3 x 3 dot patterns for each output pixel value. The "HIGH" value produces a picture 10.5 inches square by utilizing 4 x 4 dot patterns for each output pixel value. Due to the standard size of the Versatec output paper, "HIGH" quality images span two pages.

TEMPLOC defines the directory location in which the temporary spool file for the Versatec plotter will be created. Since this file is very large (820 blocks for "LOW" quality, 1075 blocks for "HIGH" quality), be sure that

there is sufficient disk space for the file.

5.8 IAT Utilities

PROGRAM ALLOC

Allocate an IAT Device

FUNCTIONAL DESCRIPTION

ALLOC allocates an image analysis terminal device (IAT) for use by the user's process during an interactive session. If the requested device is allocated to another user, a message will be output indicating that the requested device is "busy."

IATSTAT displays the status of the system's display devices.

PROGRAM DESCRIPTION

ALLOC TUTOR

PARAMETER -----	DESCRIPTION -----
IATNAM	Image analysis terminal name

IATNAM is the name of the display device to be allocated.

PROGRAM DEALLOC

Frees/Deallocates an IAT

FUNCTIONAL DESCRIPTION

DEALLOC frees/deallocates an image analysis terminal from use during an interactive session.

PROGRAM DESCRIPTION

DEALLOC TUTOR

PARAMETER -----	DESCRIPTION -----
IATNAM	Name of image analysis terminal

IATNAM is the name of the IAT device allocated. It may be "--" which defaults to any device(s) already allocated.

PROGRAM IATINIT

Initialize an IAT Device

FUNCTIONAL DESCRIPTION

IATINIT performs either a total or selective initialization of the user's allocated IAT device. An "IMAGE" initialization will clear all the IAT memories, load linear look-up tables, reset display device registers (i.e., shift, zoom, etc.) and reset the display management tables to reflect an initial state. A "GRAPHIC" initialization will clear all bitplane overlays, set the graphic planes to default colors and reset any functional graphic registers. The cursor is turned off in either case.

PROGRAM DESCRIPTION

IATINIT TUTOR

PARAMETER -----	DESCRIPTION -----
TYPE	Type of initialization

TYPE is the type of initialization to be performed.

"IMAGE" will clear all the refresh memories, load linear look-up tables, reset display device registers, and reset the DMS tables.

"GRAPHICS" will clear all graphic bitplanes and reset the colors to their default values.

"IMAGE, GRAPHICS" is the default. This performs both initializations.

PROGRAM IATSTAT

Display IAT Device Status

FUNCTIONAL DESCRIPTION

IATSTAT outputs a summary listing of image analysis terminal (IAT) devices. If a specific device name is input, detailed information on the given device is output. This utility is useful for determining whether an IAT device is available for allocation by the user's process. By default, the status of all IAT devices is provided.

PROGRAM DESCRIPTION

IATSTAT TUTOR

PARAMETER -----	DESCRIPTION -----
IATNAM	IAT name or category

IATNAM is the name of the IAT device for which information is requested. It may be any one of the following:
"CHINOOK", "SANTAANA", "ALL", or "FREE".

PROGRAM IMGLST

Display Currently Defined Image Configurations

FUNCTIONAL DESCRIPTION

IMGLST displays a list of the image configurations that are currently defined. The image name, associated refresh memory numbers, memory protection, image date, and source file name are displayed in tabular form at the user's CRT terminal.

PROGRAM DESCRIPTION

IMGLST TUTOR

PARAMETER	DESCRIPTION
-----	-----
DIRECTRY	AOIPS Group Location

DIRECTRY is the AOIPS group location where images can be dropped from if desired.

The image display list will appear on the CRT after IMGLST is invoked:

*** SAMPLE DISPLAY ***

```
      Display of contents in refresh memories
V RM# P  Date      Time      Desc  Instr Band  RMP Zoom LUT | V C#
  1  N 86/07/01 16:44:12 MCR2   MCR    1      1.0 P  | 17
  2  N 86/07/01 17:05:16 LN3    MCR    6      1.0 P  | 18
  3                                     | 19
*  4  N 86/07/01 16:40:00 GOES   VISSR   IR      4.0 P  | 20
  5                                     | 21
  6                                     | 22
  7                                     | 23
  8                                     | 24
  9                                     | 25
 10                                     | 26
 11                                     | 27
 12                                     | 28
Enter:      Lock, Unlock, Drop, View, DElete, BB, Page or <cr>
          Help, Exit:
```

In the example above, there are images in refresh memories

1, 2 and 3. Once this display appears, enter "Help" for more information about the commands available in this display.

PROGRAM VIEW

View Image(s) on Allocated IAT Device

FUNCTIONAL DESCRIPTION

VIEW displays a specified IAT image or configuration. This Display Management Subsystem (DMS) procedure is rather slow; faster viewing of images is available via the Button Board (BB) utility.

PROGRAM DESCRIPTION

VIEW TUTOR

PARAMETER -----	DESCRIPTION -----
INIMAGE	Name(s) of image(s) to be viewed

INIMAGE defines the image names to be viewed together as a configuration. If a configuration is being created using various image components, names must be specified in the order of red, green, blue. To view only one band in green, specify the following: INIMAGES = ,GRNBAND,. To view a component in B/W, specify: INIMAGES = GRNBAND (no commas). Note: The total number of memories to view cannot exceed 3.

5.9 Image Transfer Utilities

PROGRAM DCO2TP

Create DICOMED Tape from a DICOMED Disk File

FUNCTIONAL DESCRIPTION

DCO2TP writes the DICO.DAT disk files produced by the DICO program to tape. The DICOMED machine located in Building 28 produces negatives or Polaroid prints from this tape.

PROGRAM DESCRIPTION

DCO2TP TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk directory/location of DICO.DAT files
TAPEDRV	Tape drive
DENSITY	Output tape density (BPI)

DIRLOC is the disk directory/location of the DICO.DAT files.

TAPDRV is the output tape drive. Valid values are MTAO: and MFAO:.

DENSITY is the density (BPI) at which the tape will be written. Valid values are: 800, 1600, or 6250.

PROGRAM DICO

Create DICOMED Image Format Tape or Disk File

FUNCTIONAL DESCRIPTION

DICO produces a DICOMED tape or disk file containing images for which hard copy can be made with the DICOMED device located in Building 28. If disk files are created, the file is named "DICO.DAT".

PROGRAM DESCRIPTION

DICO TUTOR

PARAMETER -----	DESCRIPTION -----
OUTDEV	Output device for file (TAPE,DISK)
TAPEDRV	Tape drive
SKIPFIL	Number of files to skip on output tape
DENSITY	Tape density (BPI) (800,1600,6250)
LUT_FLAG	Apply LUT with DROP? (YES,NO)

OUTDEV is the output device for the DICOMED file. If "DISK" is selected, the DICOMED format file is written to a file named DICO.DAT for later transfer to tape. To produce the DICOMED tape, run DCO2TP. The default of "TAPE" will write the files directly to the output tape device.

TAPEDRV is the tape drive for the output tape.
Valid values are "MTAO:" and "MFAO:".

SKIPFIL specifies the number of files to be skipped on the output tape. This parameter allows the user to add new image files to an existing DICOMED output tape. Up to 20 files may be skipped. Specify a value of zero (0) for a new output tape.

DENSITY is the density at which the output tape will be written.

LUT_FLAG is the flag to set whether lookup tables should be automatically loaded if images are dropped from within the DICO program via the IATSEL utility.

PROGRAM DSK2IIS

Copy Disk Image File(s) to Refresh Memory

FUNCTIONAL DESCRIPTION

DSK2IIS transfers images from disk to a designated refresh memory of the image display device. Mosaic images can be created by specifying appropriate locations for the output images on a designated refresh memory.

PROGRAM DESCRIPTION

DSK2IIS TUTOR

PARAMETER -----	DESCRIPTION -----
FILETYPE	File format type (AOIPS or OTHER)
DISKDIR	Disk/directory location of image file(s) and LUTs
FILNAME	Disk file name
INPIXLS	Number of pixels/line for image file
IMGLOC	Window location for image in refresh memory (null value centers the image)
MOSAIC	Mosaic flag (memory number) (null = no mosaic)
LUTNAME	Lookup table name
LINSTART	Start line for OTHER disk file
PIXSTART	Start pixel for OTHER disk file
LSKIP	Line skip factor for OTHER disk file
PSKIP	Pixel skip factor for OTHER disk file

FILETYPE is the file format type. If "OTHER" is specified, it is assumed that the **INPIXLS** field is the physical record length of the file, and that each physical record equals one image line. If "AOIPS" is specified, it is assumed that the image was created with the TAE XI package and contains a valid AOIPS image label.

DISDIR is the disk/directory location for the images.

FILNAME is the image disk file name. An example of this parameter is "I0009.IMG".

INPIXLS is the number of pixels per line of the image file.

IMGLOC specifies the starting line, starting pixel, number of lines and number of pixels in which the output image is displayed. The default centers the image in the output refresh memory.

MOSAIC specifies the refresh memory number to be used for a mosaic. A null value means that no mosaic will be done.

LUTNAME is the name of the lookup table to be applied to the output image.

LINSTART is the starting line for displaying the output image whose file format type is "OTHER".

PIXSTART is the starting pixel for displaying the output image whose file format type is "OTHER".

LSKIP is the line skip factor for the output image whose file type is "OTHER".

PSKIP is the pixel skip factor for the output image whose file type is "OTHER".

PROGRAM FROMTV

Save Image(s) in the Refresh Memory to Disk

FUNCTIONAL DESCRIPTION

FROMTV copies one or more images in display device refresh memory to a disk. The image can be saved to its original location by setting the save flag to "YES".

PROGRAM DESCRIPTION

FROMTV TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location
SAV2ORG	Save image in original source file location?

DIRLOC is the disk/directory location for the images that are to be saved.

SAV2ORG is a flag to specify if the image(s) are to be saved to their original location (original name) with a new version number. For example, if the image originally came from I0025.IMG;1, it will be saved on disk as I0025.IMG;2. Purge old versions using DCL PURGE. SAV2ORG cannot be set to "YES" for dynamic images.

PROGRAM TAP2IIS

Copy Tape Image Data to an IIS Refresh Memory

FUNCTIONAL DESCRIPTION

TAP2IIS copies image data from tape to a specified refresh memory on the IAT device. To view color DICOMED tape images, transfer the 3 files (R,G,B) to 3 refresh memories and then view the image as a configuration.

PROGRAM DESCRIPTION

TAP2IIS TUTOR

PARAMETER -----	DESCRIPTION -----
TAPEDRV	Tape drive name(s)
NTAPES	Number of tapes to be processed
STFILE	Starting file number
NFILES	Number of files to be processed
LINSTART	Starting record
PIXSTART	Starting pixel
LSKIP	Number of lines to be skipped
PSKIP	Number of pixels to be skipped

TAPEDRV is the name of the tape drive(s) to be used. Two tape drives may be used alternatively to process tapes. Valid tape drive names are "MTAO:" and "MFAO:".

NTAPES is the total number of tapes to be processed.

STFILE is the number of the first file to be processed.

NFILES is the total number of files to be processed.

LINSTART is the starting record to be processed.

PIXSTART is the starting pixel to be processed.

LSKIP is the number of lines to be skipped. This parameter is used for sub-sampling.

PSKIP is the number of pixels to be skipped. This

parameter is used for sub-sampling.

5.10 Image Manipulation Utilities

PROGRAM ADD

Addition/Subtraction of Images

FUNCTIONAL DESCRIPTION

ADD adds (subtracts) two images. Any linear combination of two images is possible. The following equation is used:

$$\text{Result_Image} = \text{Factor_1} * \text{Image_1} + \text{Factor_2} * \text{Image_2} + \text{Constant}$$

A default value of 1.0 for the two factors results in the addition of the two images. A value of -1.0 for either factor results in a subtraction of the images.

0.0 is the default value of the constant.

The output image is always 512 pixels by 512 lines.

PROGRAM DESCRIPTION

ADD TUTOR

PARAMETER -----	DESCRIPTION -----
FACTORS	Image multipliers
CONSTANT	Constant to add on to result
INGROUP	Image group directory

FACTORS are used as multipliers on the input pixel values for the image data from the two source images. Use the default values of (1.0,1.0) for addition of images or either (-1.0,1.0) or (1.0,-1.0) for subtraction of the images. Use of other values allows any arbitrary linear combination of the two input images.

CONSTANT is the constant which will be added on to the resultant image. The default is 0.0, meaning that there is no constant value added.

INGROUP is the name of the image group where the image directory is located. The default is the current image group in the TAE global parameter F\$FILLOC.

PROGRAM ALIGN

Align IAT Images Interactively

FUNCTIONAL DESCRIPTION

ALIGN allows the interactive alignment of up to 12 images using the IIS button and trackball control functions. All the images selected will be aligned against the base (first) image. Image names may be specified at the PDF level, or selected from the IAT image list. The new image offsets (pixel,line) in the image label will be updated accordingly.

PROGRAM DESCRIPTION

ALIGN TUTOR

PARAMETER -----	DESCRIPTION -----
IMGNAMEs	Image names

IMGNAMEs defines the names of the images to be aligned (minimum of two images). The maximum number of images that can be aligned at a time depends upon the number of refresh memories available on the display device. Images will be aligned using the first image selected as the base image. The default image name of a null string displays the image selection list for user selection of images to be aligned.

The following IIS button board will appear after the tutor:

	A	B	C	D	F
3	Switch current image	View base image	View current image	Toggle loop speed	Exit
2	Loop two images	Loop all images	Cursor on/off	Graphics on/off	Help
1	Unshift current image	Shift current image	Reset cursor	Move cursor	Define

ALIGN BUTTON MENU

1A: Unshift current image

Resets line and pixel shift of current image to zero

1B: Shift current image

Enables trackball for shifting current image

1C: Reset cursor

Resets cursor position

1D: Move cursor

Enables cursor movement using trackball

1F: Define

Updates image label(s) with current line and pixel offsets on the aligned image(s)

2A: Loop two images

Loops base image with current image

2B: Loop all images

Loops all images

2C: Cursor on/off

Toggles cursor on/off

2D: Graphics on/off

Toggles graphics planes on/off

2F: Help

Displays help information for each IIS button

3A: Switch current image

Makes next image in alignment sequence the current image
to be aligned with the base image

3B: View base image

Displays base (first) image

3C: View current image

Displays current image

3D: Toggle loop speed

Changes image loop speed

3F: Exit

Exits the ALIGN program

PROGRAM BORDER

Write Border Around an Image

FUNCTIONAL DESCRIPTION

BORDER writes an image border onto a disk image file. If possible, the image will be expanded so that the least amount of data will be overwritten. Both the border size and its grey value are specified by inputs.

PROGRAM DESCRIPTION

BORDER TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location
BSIZE	Border size
GREY	Grey value of border
DESC	Image description (8 char max)

DIRLOC specifies the disk/directory location of the image directory from which an image is to be selected.

BSIZE is the size the border to be engraved onto the image. Specify the width of the border in terms of the number of lines/pixels. If possible, the image will be expanded by BSIZE in the top, bottom, left, and right directions so that image data will not be overwritten.

GREY is the grey value of the image border. The valid range is "0" to "255".

DESC is an 8-character string describing the image. It is stored in the image directory.

PROGRAM CNTOUR

Contour Image Grey Values onto Graphics Bitplanes

FUNCTIONAL DESCRIPTION

CNTOUR contours specified grey values of images. A maximum of seven grey values and seven bit planes can be used for contouring during one execution of the program. The entire image can be contoured (default), or only that portion defined by the graphics box (BOXOPT="YES").

The algorithm used does not apply any smoothing. If a smooth contour is desired, smooth the image data first before running CNTOUR.

PROGRAM DESCRIPTION

CNTOUR TUTOR

PARAMETER -----	DESCRIPTION -----
DIRLOC	Disk/directory location
GRVALS	Grey values to be contoured
BITPLNS	Bitplane for each contoured grey value
CLRBIT	Clear selected bit planes? (YES,NO)
BOXOPT	Select portion of image to contour by using box? (YES,NO)

DIRLOC specifies the disk/directory location of the images to be contoured. The default value is the current group location.

GRVALS specifies the grey values to be contoured. A maximum of seven (7) values may be contoured at any one time.

BITPLNS specifies the graphics bit plane to be used for each grey value to be contoured. There is a one-to-one correspondence between GRVALS and BITPLNS. Valid values for BITPLNS are from 1 to 7.

CLRBIT is a flag to clear the bit planes specified by BITPLNS before drawing the contours. By default, the bit

planes are cleared before contouring.

BOXOPT is a flag to select whether the entire image should be contoured ("NO") or only that portion defined by using the box in the IIS button board "YES". By default, the entire image is contoured.

The following IIS button board display appears if BOXOPT="YES" is selected:

	A	B	C	D	F
3					Exit
2		Move	Shape		Help
1					Define

CNTOUR (BOXOPT="YES") IIS BUTTON BOARD

1F: Define

Accepts the current box position and shape for CNTOUR

2B: Move

Moves box using trackball

2C: Shape

Shapes box using trackball

3F: Exit

Exits the CNTOUR program

PROGRAM DESTRIPE

Remove Stripes from a Satellite Image

FUNCTIONAL DESCRIPTION

DESTRIPE removes stripes (i.e., banded, dark lines) from an image by using one of three destriping techniques based upon the assumption that 1,2,4, or 8 satellite sensors were used to capture the data. The three techniques are: "LINEAR", "QUADRATIC", or "CUMHIS". These techniques apply linear, quadratic, or cumulative image data histogram corrections, respectively.

If any of the sensors are non-operational, (i.e., all lines for the sensor are blank) the destriping process cannot be performed. Invoke NONOISE to remove the blank lines and then destripe the image.

PROGRAM DESCRIPTION

DESTRIPE TUTOR

PARAMETER -----	DESCRIPTION -----
INIMAGE	Input refresh memory
OUTIMAGE	Output refresh memory
SENSORS	Number of sensors (1,2,4,8-default)
TECHNIQ	Destriping technique (LINEAR, QUADRATIC-default, CUMHIS)

INIMAGE is the refresh memory containing the image to be destriped. A null value will produce the image display list from which a selection may be made.

OUTIMAGE is the output refresh memory for the new (corrected) image. A null value will produce the image display list from which a selection may be made.

SENSORS specifies how many sensors were used to collect the image data. The default value of "8" should be used when processing GOES (EVISSR,WVISSR) data. Other valid values of this parameter are "1", "2", and "4".

TECHNIQ specifies the algorithm to be used to perform the

image destriping operation. Available types are:
"LINEAR", "QUADRATIC" and "CUMHIS".

PROGRAM INVERT

Inversion of Image

FUNCTIONAL DESCRIPTION

INVERT inverts an image. The operation is performed as shown in the following equation.

$$\text{Result_Image} = \text{Factor_1} * \text{Image_1} + \text{Factor_2}$$

Default values of -1.0 for Factor_1 and 255.0 for Factor_2 yield an inversion. A value of 0.0 for Factor_1 results in a constant Factor_2-valued image.

The output image is always 512 pixels by 512 lines.

PROGRAM DESCRIPTION

INVERT TUTOR

PARAMETER -----	DESCRIPTION -----
FACTORS	Image scale factors
INGROUP	Image group directory

FACTORS are used as multipliers on the input pixel values for the image data from the input source image. The default values of (-1.0,255.0) invert the image. Values of (0.0,I) produce a constant I-valued image.

INGROUP is the name of the image group where the image directory is located. The default is the current image group in the TAE global parameter F\$FILLOC.

PROGRAM MULTIPLY

Multiplication of Images

FUNCTIONAL DESCRIPTION

MULTIPLY multiplies two images. An additive factor may be specified. The operation is performed as shown in the following equation.

$$\text{Result_Image} = \text{Factor_1} * \text{Image_1} * \text{Image_2} + \text{Factor_2}$$

Default values of 1.0 for Factor_1 and 0.0 for Factor_2 yield the product of the two images. A value of 0.0 for Factor_1 produces a constant Factor_2-valued image.

The output image is always 512 pixels by 512 lines.

PROGRAM DESCRIPTION

MULTIPLY TUTOR

PARAMETER -----	DESCRIPTION -----
FACTORS	Image scale factors
INGROUP	Image group directory

FACTORS are used as multipliers on the input pixel values for the image data from the two source images. The default values of (1.0,0.0) yield the product of the two input images. Values of (0.0,I) produce a constant I-valued image.

INGROUP is the name of the image group where the image directory is located. The default is the current image group in the TAE global parameter F\$FILLOC.

PROGRAM NONOISE

Remove Noise from an Image

FUNCTIONAL DESCRIPTION

NONOISE removes various types of noise from images. Pixel values are processed without the application of lookup tables (LUTs). Blank or bad lines may be removed by interpolation with adjacent lines, spikes may be removed by comparison with adjacent pixel values, or noise may be removed after location by image grey level slicing.

A "spike" is a pixel value that differs grossly from the adjacent pixel values (either much higher or much lower). When removing spike noise, keep the size of the box as small as possible, since deviations are computed for every square nine pixel subgroup within the box. The number of computations performed is dependent upon the size of the box.

PROGRAM DESCRIPTION

NONOISE TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Disk/directory location of image(s)

INGROUP is the disk/directory location of the images for which noise removal will be performed.

The following IIS button board appears after the image has been selected:

	A	B	C	D	F
3	High level slice	Low level slice	Specify bad lines to delete	Remove blank lns in box	Exit
2	Remove one spike w/in box	Remove two spikes w/in box	Remove 5 spikes w/in box	Remove specified # spikes	
1	Box entire image	Default box	Move box	Change box shape	Select

NONOISE BUTTON MENU

1A: Box Entire Image

Sizes graphics box to fit entire image

1B: Default Box

Resets graphics box to default size

1C: Move Box

Moves graphics box

1D: Change Box Shape

Shapes graphics box

1F: Select New Image

Displays image selection list for new image selection

2A: Remove One Spike Within Box

Removes one noise spike from image area bounded by graphics box

2B: Remove Two Spikes Within Box

Removes two noise spikes from image area bounded by graphics box

2C: Remove Five Spikes Within Box

Removes five noise spikes from image area bounded by graphics box

2D: Remove Specified # of Spikes Within Box

Removes user input number of spikes from image area bounded by graphics box

3A: High Level Slice

Removes noise values near grey value 255 from image area bounded by graphics box

3B: Low Level Slice

Removes noise values near grey value 0 from image area bounded by graphics box

3C: Specify Bad Lines to Delete Within Box

Removes user-specified bad lines from image area bounded by graphics box (specification is line number)

3D: Remove Blank Lines from Image

Removes blank lines (no data) from image area bounded by graphics box

3F: Exit

Exits the NONOISE program

PROGRAM SMOOTH

Smooth Images Using Convolution

FUNCTIONAL DESCRIPTION

SMOOTH performs smoothing of images using a two-dimensional spatial convolution. The algorithm employed is of the form:

$$P'(x,y) = \sum_{i=-m/2}^{m/2} \sum_{j=-n/2}^{n/2} P(x+i, y+j) * \text{WEIGHTS}(i,j)$$

(SUM is the summation function).

$P'(x,y)$ is the resultant pixel intensity after convolution, x is the pixel line position of the pixel, y is the line number of the pixel, $P(x,y)$ is the original pixel intensity, WEIGHTS is an $n \times m$ array containing the convolution kernel, n is the number of kernel elements per row, and m is the number of kernel elements per column.

Grey values are changed by the smoothing process, hence the user should revise any LUTs applied to the images to account for this change.

PROGRAM DESCRIPTION

SMOOTH TUTOR

PARAMETER -----	DESCRIPTION -----
FILELOC	Disk/directory location
FILTSIZ	Filter width (lines, pixels)
WTDEF	Use default weights? (YES,NO)

FILELOC is the disk/directory location of the images to be smoothed. The default value is the current image group.

FILTSIZ specifies the filter shape which is used to perform the convolution. The length multiplied by the width gives the total number of weights required to perform the convolution.

WTDEF is a flag to set default weights to be used for

specified filter sizes. If the user selects one specified filter size and sets WTDEF to "YES", there will be no further prompt for input to the weights. Default weights selected are based upon theoretical considerations (e.g., predicted response functions). Filter sizes have default weights 3 x 3 and 5 x 5. In order to see these default weights, set WTDEF to "NO". The filter sizes of 3 x 3 and 5 x 5 should be sufficient for most smoothing applications.

CONVOLUTION FILTER WEIGHTS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
WEIGHTS	Smoothing weights (n rows by m cols)

WEIGHTS specifies the weights to be used for the n by m filter array for the convolution. Values along rows must be entered first.

CONVWTS is the dynamic tutor invoked by the program SMOOTH. This dynamic tutor displays the default weights for the two-dimensional spatial convolution.

The smoothing algorithm employed is of the form:

$$P'(x,y) = \sum_{i=-m/2}^{m/2} \sum_{j=-n/2}^{n/2} P(x+i, y+j) * \text{WEIGHTS}(i,j)$$

(SUM is the summation function).

P' (x,y) is the resultant pixel intensity after convolution, x is the pixel line position of the pixel, y is the line number of the pixel, P (x,y) is the original pixel intensity, WEIGHTS is an n x m array containing the convolution kernel, n is the number of kernel elements per row, and m is the number of kernel elements per column.

PROGRAM STRETCH

Grey Level Contrast Stretch an Image

FUNCTIONAL DESCRIPTION

STRETCH performs automatic grey level stretching of an image based upon the user-defined bin size. The stretching is performed by producing a new grey level Look-Up Table (LUT) using the bin size specification. This new LUT can then be set as the Primary, Secondary LUT (or Both) for the output image.

PROGRAM DESCRIPTION

STRETCH TUTOR

PARAMETER	DESCRIPTION
-----	-----
INIMAGE	Input refresh memory
OUTIMAGE	Output refresh memory
BINSIZ	Bin size
APPLYLUT	Stretch LUT output (Primary-default, Secondary,Both)

INIMAGE is the refresh memory containing the image to be stretched. A null value will produce the image display list from which a selection may be made.

OUTIMAGE is the output refresh memory for the new (stretched) image. A null value will produce the image display list from which a selection may be made. Specifying the output refresh memory to be the same as the input refresh memory may cause the original LUTs of the input memory to be lost.

BINSIZ is the size of the grey level bin for the stretch. It specifies the number of pixel values to be considered as belonging to the same grey level output value.

APPLYLUT specifies where the output (stretched) LUT is to be assigned. The Primary or Secondary LUTs (or Both) of the output refresh memory may be replaced by the new (stretched) LUT.

PROGRAM WEDGE

Write Grey Scale Wedge on Image(s)

FUNCTIONAL DESCRIPTION

WEDGE writes grey scale wedges on images. A maximum of sixteen images can have wedges written in one cycle of the program. The wedge size (in lines) can be specified, as well as the wedge location (top, bottom, left, right, or top and bottom, left and right) on the image. If the image is not 512 lines by 512 pixels, it will be expanded to this size before the wedge is written to it.

The normal wedge consists of 256 pairs of equal-valued pixels from 0 to 255. The calibration wedge consists of 256 pairs of equal-valued pixels from -128 to +127. Both wedges are 512 pixels in length.

PROGRAM DESCRIPTION

WEDGE TUTOR

PARAMETER	DESCRIPTION
-----	-----
IMAGE	Image name
TYPE	Type of wedge (NORMAL-default, CALIBRATION)
SIZE	Wedge size (lines)
LOCATION	Wedge location (TOP, BOTTOM, LEFT, RIGHT, TOPBOT, LFTRGT)

IMAGE is the name of the image(s) in refresh memory to which the wedge is to be written. The default null value produces the IMAGE SELECTION LIST from which the user can select images for wedge application.

TYPE is the type of wedge to be applied. The "NORMAL" wedge (default) has pixel values from 0 to 255 in pairs. The "CALIBRATION" wedge has pixel values from -128 to +127 in pairs. Both types of wedge are 512 pixels long.

SIZE is the size in lines of the wedge to be written to the image(s). The default size is 30 lines. The length of the wedge in pixels is fixed at 512. An image less than 512 lines by 512 pixels in size will be expanded to 512 lines by 512 pixels before the wedge is written.

LOCATION specifies where the wedge is to be written on the image. The wedge may be written to the "BOTTOM" (default) or "TOP" lines of an image, the "LEFT" or "RIGHT" side, or to "TOPBOT" (the top and bottom lines), or "LFTRGT" (the left and right sides).

5.11 Lookup Table Utilities

PROGRAM CPIMAG

Copy Image from Refresh Memory through a Lookup Table

FUNCTIONAL DESCRIPTION

CPIMAG copies an image in refresh memory through a lookup table (LUT). This program creates a dynamic image which has altered grey values from the original refresh memory image. The new image can be saved to disk, if desired.

PROGRAM DESCRIPTION

CPIMAG TUTOR

PARAMETER -----	DESCRIPTION -----
FILELOC	Disk/directory location
WRTFLAG	Write resultant image to disk?

FILELOC is the disk/directory location of the image which is to be copied through the LUT. The default value is the current group location.

WRTFLAG is the flag determining whether the resultant image should be written to the disk/directory location specified by FILEOC. The default value is "NO".

PROGRAM LUTCOPY

Copy Lookup Table(s) from a Catalog to the User's Catalog

FUNCTIONAL DESCRIPTION

LUTCOPY copies one or more LUTs from another catalog to the current default catalog. The source catalog may be another user's catalog or another catalog of the user.

PROGRAM DESCRIPTION

LUTCOPY TUTOR

PARAMETER -----	DESCRIPTION -----
INGROUP	Source catalog location
MYGROUP	Destination catalog location

INGROUP is the host file specification of the group directory containing the LUT catalog that contains the LUTs to be copied.

MYGROUP is the host file specification of the group directory of the user's LUT catalog where the LUTs are to be copied to. The default is the current group directory location.

PROGRAM LUTDELET

Delete Lookup Table(s) from the LUT Catalog

FUNCTIONAL DESCRIPTION

LUTDELET deletes one or more LUTs from the specified LUT catalog.

PROGRAM DESCRIPTION

LUTDELET TUTOR

PARAMETER -----	DESCRIPTION -----
LUTNAME	Name of LUT to delete
INGROUP	LUT catalog location

LUTNAME is the name of the LUT to be deleted. A valid LUT name is the letter L followed by 1 to 4 digits(L1 to L9999). If a LUT name is not specified, a name can be selected from a displayed list of LUTs.

INGROUP is the host system location of the LUT and LUT catalog from which deletion is to occur. The default is the current group location.

PROGRAM LUTEDIT

Create/Edit LUT

FUNCTIONAL DESCRIPTION

LUTEDIT allows the creation of a new LUT or the capability to edit an existing LUT and to catalog it in a LUT catalog. A LUT for a currently displayed image can be edited with the changes taking place on the image LUT as the changes are being made.

PROGRAM DESCRIPTION

LUTEDIT TUTOR

PARAMETER -----	DESCRIPTION -----
LUTNAME	Name of LUT to edit
IMAGE	Image name
INGROUP	LUT catalog location
APPLYLUT	How to apply LUT (PRIMARY, SECONDARY)

LUTNAME is the name of the LUT to be edited. A valid LUT name is the letter L followed by 1 to 4 digits (i.e. L1 to L9999). Use a question mark (?) to request a list of the catalog from which the desired LUT may be selected. If no selection is made or this parameter was set to blanks, the default METPAK System Color Definition Table will be used as the base from which editing operations begin. None of the colors will have ranges assigned so that the actual lookup table will be sequential black/white.

IMAGE is the name of the image whose LUT is to be modified, with the changes appearing on the image as they are made. Use a question mark "?" to interactively select the image from a list of all images in the display device, or a specific image name or blanks to edit a cataloged LUT.

INGROUP specifies the location of the catalog file from which the specified LUT, if any, is to be loaded and/or cataloged. Once specified, the catalog cannot be changed within the LUT Editor. Use the LUTCOPY program to copy a LUT from one catalog to another.

APPLYLUT specifies which LUT is to be affected by the specified image. If an image is not specified, this

parameter is ignored. Valid values of this parameter are:

"PRIMARY"	Load/change primary LUT only
"SECONDARY"	Load/change secondary LUT only

Note that the specified LUT becomes the enabled LUT for that image.

The following are the command formats and definitions for the LUT editor's management of LUTs:

Get Get LUT=old_lut_name

GET loads the specified LUT from the LUT catalog. The LUT name is of the form L1 to L9999.

Edit

EDIT invokes the LUT editor and allows interactive editing of the LUT. If an image name was specified, all changes immediately appear on the image.

Cat Cat LUT=new_lut_name Desc=description

CAT catalogs the current LUT into the LUT catalog file and creates the disk file(s) containing the LUT (and table).

Ren Ren LUT=new_lut_name Type=lut_type Desc=description

REN changes the LUT name, type, and description.

Def Def LUT=new_lut_name Type=lut_type Desc=description

DEF defines a new LUT name, with description and type.

List

LIST displays the contents of the LUT catalog.

Help

HELP displays the help file.

Quit

QUIT exits LUTEDIT without cataloging the LUT.

eXit

eXit exits LUTEDIT and catalogs the current LUT if it has not already been cataloged.

Use a ? for the old_lut_name to interactively select a LUT from the catalog list. Use a * for the new_lut_name to force a new_lut_name to be assigned automatically.

Supported LUT types:

NUMBERS - A LUT of this type consists of three segments (groups) of numbers, one for each color gun (Red, Green, Blue). This type of LUT is used mostly for black and white images or to add a slight amount of color to bring specific image features out of an image.

TABLE - A LUT of this type consists of a color definition table that specifies how to build the LUT from the named colors which have specific gun value assignments. The three segments are automatically built from this table transparently. Up to 256 color assignments are currently supported. A color contrast factor value can be set for each color independently, to provide the ability to vary the intensity of a color throughout its range of values.

The following are the definitions, formats and information for the available LUT editor edit commands:

```

Rgb      Rgb  cn  r  g  b
---
Red/green/blue value modification

HIs      HIs  cn  h  i  s
---
Hue/intensity/saturation change

Ccf      Ccf  cn  f
---
Color contrast factor modification

Span      Span  cn  lo  hi
----
Span (range) for color modification

Toggle    Toggle  cn
-----
Toggle color enable/disable flag

Letter    Letter  cn  x
-----
Letter (print character) change

Delete    Delete  cn  [cn]
-----
Delete color entry(s) from table

```

Inter Inter cn cn

Interchange two color's range

Name Name cn [nm]

Name a color to new name or repeat it

Block Block cn cn lo hi

Block color assignment

Block[S or M] Block[S or M] cn cn lo hi

Block stretch/shrink or move via trackball

Where:

cn = color reference number (1 <= cn <= 256)

r/g/b = red/green/blue values (-1 <= r,g,b <= 255)

h/i/s = hue/intensity/saturation value(-1 <= h,i,s <= 255)

f = color contrast factor (0 <= f <= 100)

lo/hi = low/high range values

x = a character

nm = a color name

Note: -1 for r, g, b, h, i, or s means to leave present
value alone.

ARgb ARgb r g b nm

Add color by red/green/blue (default)

AHis AHis h i s nm

Add color by hue/intensity/saturation

Order Order

Order (Sort) colors by increasing range

Wedge Wedge[_ or N or C] y

Wedge (Top,Bot,Lft,Rgt,TopBot,LftRgt) (Normal,Calib.)

M M

Character map printout for image area.

Page <CR> or Page _ or + or - or * or n

Pages through the LUT table

Help Help

Help display

Up Up

Up (back) to top level command mode

Quit Quit

Quits the Edit mode without cataloging the LUT

eXit X

Exits from the Edit mode and catalogs the LUT

Where:

r=red value, g=green value, b=blue value, h=hue value,
i=intensity value, s=saturation value, nm=a color name,
n=a page number, <CR>=carriage return, +=next page,
--previous page, *=last page, _=blank space(s), y=Top,
Bottom, Left, Right or _.

Note:

-1 for r, g, b, h, i, or s means to leave present value
alone, -1<=r,g,b,h,i,s<=255, n>0. WEDGES: Normal is
0 to 255, Calibration is -128 to +127.

List segment(s) Li

Lists segments, where i is the segment identifier. If i
is omitted, all segments are listed.

Modify segment(s) Mi Start=num End=num First=num Last=num

Modifies segments, where i is the segment identifier. If i
is omitted, all segments are modified. All numbers range
from 0 to 255. The segment values are filled in from
the Start to the End position with values beginning with
First up through Last. Intermediate values are calculated
by interpolation between First and Last.

Examples:

MG 0 255 0 255 Set green segment to sequential.
MR 0 10 Set red segment to value 10 in position 0.
MB 5 10 5 10 Set blue segment to values 5-10 in
 positions 5-10.
M 0 255 100 set all segments to grey level value 100.
M 0 255 255 0 set all segments to inverse sequential.

Segment Identifiers: <space>=ALL R=RED G=GREEN B=BLUE

PROGRAM LUTLINK

Link Lookup Table (LUT) to Image Disk File(s)

FUNCTIONAL DESCRIPTION

LUTLINK links a color or black-and-white Lookup Table to one or more image files on disk. Once LUTs have been linked to images, they may be dropped with the automatic application of the LUT (see "APPLYLUT" parameter in DROP). Images dropped from the Button Board Utility will automatically apply the LUT, if it is linked to the image(s).

PROGRAM DESCRIPTION

LUTLINK TUTOR

PARAMETER -----	DESCRIPTION -----
LUTNAME	LUT Name (_ or L1-L9999)
IMAGE	Image name (_ or I1-I9999)
LINGROUP	Disk/directory location for LUTs
IINGROUP	Disk/directory location for images
TYPE	Type of LUT link(s) (PRIMARY,SECONDARY, BOTH-default)
CATEGORY	Link category (1-BAND,2-BAND, 3-BAND,ALL-default)
RCONFIRM	Confirm link replacement?

LUTNAME is the name of the LUT to be linked to the image files. A valid LUT name is the letter L followed by 1 to 4 digits (L1 to L9999). If a LUT name is not specified, a name can be selected from a displayed list of LUTs.

IMAGE is the name of the image to which the LUT is to be linked. This name can be at most eight characters in length. If the image name is not specified, a name can be selected from a displayed list of images. This feature allows linking a single LUT to multiple images.

LINGROUP specifies the host system directory location of

the LUT catalog. The default value is the current group directory location.

IINGROUP specifies the host system directory location of the group of images to be linked are located. The default value is the current group directory location.

TYPE specifies which LUT link(s) are to be set within the specified link category (see CATEGORY parameter). Valid values include "PRIMARY", "SECONDARY" or "BOTH".

CATEGORY specifies how the LUT is to be linked to the image(s). Links can be established according to how the image is to be used. The valid values are:

"1-BAND"	Set links for image used by itself.
"2-BAND"	Set links for image used for stereo configuration.
"3-BAND"	Set links for image used for color configuration.
"ALL-BANDS"	Set links for any image usage.

RCONFIRM confirms which LUT links are being overwritten by the new links. For each link that is replaced, a message is written to the CRT terminal screen.

PROGRAM LUTLIST

List Lookup Table (LUT) Catalog and Lookup Tables

FUNCTIONAL DESCRIPTION

LUTLIST lists the LUTs contained in the specified catalog and optionally lists any of the LUTs. The listing can be directed to either the terminal or the default printer.

PROGRAM DESCRIPTION

LUTLIST TUTOR

PARAMETER -----	DESCRIPTION -----
LUTNAME	Name of LUT to list
INGROUP	LUT catalog location
DUMP	List LUT option flag (YES-default,NO)
DEVICE	Output device (TERMINAL,PRINTER)

LUTNAME is the name of the specific LUT to be listed. It overrides the value of the LUTDUMP parameter when it is not blank. Only this LUT will be listed in that case. To allow multiple LUT listings and/or interactive selection of LUTs to be listed, specify a blank value for this parameter and a "YES" value for the LUTDUMP parameter.

INGROUP specifies the location of the catalog file which is to be listed. The default is the current file location.

DUMP specifies if the LUTs are to be listed. The default value of "YES" specifies that LUTs are to be selected from a list of available LUTs unless a LUT is specified via the LUTNAME parameter. The value of "NO" specifies that no LUT listings are desired.

DEVICE specifies where the listings will be produced. The value "TERMINAL" causes all listings to be produced on the CRT terminal screen. "PRINTER" causes the outputs to be produced on the printer specified by the AOIPS Global Printer parameter F\$PRINT. The destination printer may be changed by using the process PRINTER.

PROGRAM LUTLOAD

Load Lookup Table to Image(s) in the IAT Display Device

FUNCTIONAL DESCRIPTION

LUTLOAD loads a Lookup Table (LUT) to one or more images residing in refresh memory of the display device.

PROGRAM DESCRIPTION

LUTLOAD TUTOR

PARAMETER -----	DESCRIPTION -----
LUTNAME	LUT name
IMAGE	Image name
INGROUP	LUT catalog location
APPLYLUT	How to apply LUT (PRIMARY, SECONDARY, or BOTH)

LUTNAME is the name of the LUT to be loaded to the image files. A valid LUT name is the letter L followed by 1 to 4 digits (L1 to L9999). If a LUT name is not specified, a name can be selected from a displayed list of LUTs.

IMAGE is the name of the image to which the LUT is to be loaded. This name can be at most eight characters in length. If the image name is not specified, a name can be selected from a displayed list of images. This feature allows loading a single LUT to multiple images.

INGROUP specifies the location of the LUT catalog file from which the LUT is to be loaded. It defaults to the current AOIPS group file location.

APPLYLUT specifies which LUT(s) are to be used for the specified image(s). Valid values are:

"PRIMARY"	Load primary LUT only.
"SECONDARY"	Load secondary LUT only.
"BOTH"	Load both LUTs.

PROGRAM LUTMOVE

Move Lookup Table(s) From One Image in Refresh Memory

FUNCTIONAL DESCRIPTION

LUTMOVE moves the PRIMARY, SECONDARY, or BOTH LUTs of an image in the IAT display device to one or more images in the display device.

PROGRAM DESCRIPTION

LUTMOVE TUTOR

PARAMETER -----	DESCRIPTION -----
LUTTYPE	(PRIMARY, SECONDARY, or BOTH)

LUTTYPE identifies which LUTs are to be moved. Valid values are: "PRIMARY", "SECONDARY", or "BOTH".

PROGRAM LUTSAVE

Catalog a Lookup Table from an Image in the IAT Display Device

FUNCTIONAL DESCRIPTION

LUTSAVE catalogs a LUT that is currently applied to an image residing in the refresh memory of the display device. The saved LUT will be of LUT type "NUMBERS".

PROGRAM DESCRIPTION

LUTSAVE TUTOR

PARAMETER -----	DESCRIPTION -----
IMAGE	Image name
LUTTYPE	Type of LUT to save (PRIMARY,SECONDARY)
DESCRIPT	LUT description
INGROUP	LUT catalog location

IMAGE is the name of the image from which the LUT is to be cataloged. This name can be at most eight characters in length. If the image name is not specified, a name can be selected from a displayed list of images.

LUTTYPE specifies whether the "PRIMARY" or "SECONDARY" LUT is to be saved from the image.

DESCRIPT is a description of the LUT to be saved. It may be up to 24 characters in length. If this parameter is not specified, a default description for the LUT will be created. This description will contain the name of the image whose LUT was saved.

INGROUP is the group directory location where the LUT is to be cataloged. The default is the current group directory location.

PROGRAM LUTUNLNK

Unlink Lookup Table(s) from Image Disk File(s)

FUNCTIONAL DESCRIPTION

LUTUNLNK unlinks LUTs from one or more image files on disk.

PROGRAM DESCRIPTION

LUTUNLNK TUTOR

PARAMETER	DESCRIPTION
-----	-----
IMAGE	Image name (_ or I1-I9999)
INGROUP	Disk/directory location of images
TYPE	Type of LUT link(s) (PRIMARY,SECONDARY, BOTH-default)
CATEGORY	Link category (1-BAND,2-BAND, 3-BAND,ALL-default)
RCONFIRM	Confirm Link removal?

IMAGE is the name of the image from which the LUT link is to be removed. This name can be at most eight characters in length. If the image name is not specified, a name can be selected from a displayed list of images. This feature allows removal of LUT links for multiple images.

INGROUP specifies the host system directory location of where the group of images are located. The default value is the current group directory location.

TYPE specifies which LUT link(s) are to be removed within the specified link category (see **CATEGORY** parameter). Valid values are: "PRIMARY", "SECONDARY" or "BOTH".

CATEGORY specifies which LUT links are to be removed from the images(s). The link categories that can be removed are:

"1-BAND"	Remove links for image used by itself.
"2-BAND"	Remove links for image used for stereo configuration.
"3-BAND"	Remove links for image used for color configuration.

"ALL-BANDS" Remove links for any image usage.

RCONFIRM specifies if the links that are deleted should be written to the user's terminal device. If a link to be deleted was not actually set, no message will be given.

5.12 Navigated Image Utilities

PROGRAM MAPGRID

Plot Lat/Lon Grids, Political Boundaries on Navigated GOES

FUNCTIONAL DESCRIPTION

MAPGRID plots lat/lon grids, political boundaries and annotation strings on navigated GOES satellite images, GEMPAK projection images, and radar images in the earth coordinate system. The GOES satellite images must be associated with navigation files in order for MAPGRID to work correctly. GEMPAK projection images must be one of the seven valid GEMPAK projections. The radar images must be either CAPPI or PPI projections.

PROGRAM DESCRIPTION

MAPGRID TUTOR

PARAMETER -----	DESCRIPTION -----
DIRECTRY	Disk/directory location for images

DIRECTRY specifies the location (disk & directory) of the image files. The default is the group currently defined.

IMAGE GRIDDING FUNCTION PARAMETERS DYNAMIC TUTOR

PARAMETER	DESCRIPTION
A_MINLAT	Minimum value of latitude for gridding
B_MAXLAT	Maximum value of latitude for gridding
C_MINLON	Minimum value of longitude for gridding
D_MAXLON	Maximum value of longitude for gridding
E_LATINT	Grid point interval for latitudes (degrees)
F_LONINT	Grid point interval for longitudes (degrees)
LALABINT	Labeling increment for latitudes on grid
LOLABINT	Labeling increment for longitudes on grid
G_STLBLA	Grid point number from minimum longitude to plot latitude labels
H_STLBLO	Grid point number from minimum latitude to plot longitude labels
I_CLDHGT	Cloud height for remapping grid
J_GREY	Grey level for engraving
STRANT	Annotation string
LINANNOT	Image line for plotting of annotation string
PIXANNOT	Center image pixel for annotation string
K_ANNMUL	Annotation size multiplication factor
MAPRES	Political map resolution (HIGH,MEDIUM,LOW)
BPLANE	Bit plane number for graphic overlay
GPKFNAME	Name of GEMPAK grid file
SETNAME	GEMPAK grid set name

A_MINLAT is the minimum latitude (degrees) that will be plotted for the lat/lon grid. The lat/lon grid will start at this latitude. The default value is the minimum latitude of the image to the nearest 0.5 degree that is on the image.

B_MAXLAT is the maximum latitude (degrees) that will be plotted for the lat/lon grid. The default value is the maximum latitude of the image to the nearest 0.5 degree

that is on the image.

C_MINLON is the minimum longitude (degrees) for the lat/lon grid. The grid will start at this longitude. The default value is the minimum longitude of the image to the nearest 0.5 degree that is on the image.

D_MAXLON is the maximum longitude (degrees) for the lat/lon grid. The lat/lon grid will end at this longitude. The default value is the maximum longitude of the image to the nearest 0.5 degree that is on the image.

E_LATINT is the latitude interval (degrees) that will be between latitude markers for the lat/lon grid.

F_LONINT is the longitude interval (degrees) that will be between longitude markers for the lat/lon grid.

LALABINT specifies the frequency for labeling latitudes plotted on the grid. If 1,2 is specified, then every other latitude interval will be plotted.

LOLABINT specifies the frequency for labeling longitudes plotted on the grid. If you specify 1,2 then every other longitude interval will be plotted.

G_STLBLA is the grid point number from the minimum longitude to plot the latitude labels.

H_STLBLO is the grid point number from the minimum latitude to plot the longitude labels.

I_CLDHGT is the cloud height used when remapping the grid or political map. The default value of 0.0 means that the grid or map will be remapped to the surface.

J_GREY is the grey value used for engraving onto the image.

STRANT is the annotation string.

LINANNOT is the image line for plotting the annotation string.

PIXANNOT is the image pixel on which the annotation string is centered.

K_ANNMUL controls the size of annotation for the lat/lon labels and the character string. This parameter multiplies the default GEMPLT annotation size. For example if 2.0 is specified, the strings will be twice the default size. To inhibit text plotting, enter a negative number.

MAPRES is the political map boundary resolution. Valid

values are: "HIGH", "MEDIUM", AND "LOW".

BPLANE is the bit plane number for the graphics overlay.

GPKFNAME specifies the GEMPAK grid file name. The AOIPS group is appended onto this name by the software. Thus, the GEMPAK file that is created will be found in the AOIPS group location.

SETNAME is a description of the grid that is put into the GEMPAK grid file label.

The IMAGE GRIDDING FUNCTION PARAMETERS DYNAMIC TUTOR allows the modification of the characteristics of the grid which is superimposed on the image.

The following IIS button board will appear after the tutor:

	A	B	C	D	F
3	Select new image	Toggle graphics on/off	Write grey values		Exit
2	Draw grid lines	Clear graphics	Engrave graphics	Change graphics default	Help
1	Plot grid points	Draw political boundary	Write annotat.	Plot grid,pol & annot	Write image to disk

MAPGRID BUTTON MENU

1A: Plot Grid Points

Plots and labels latitude and longitude grid markers

1B: Draw Political Boundaries

Plots the political map within the specified bounds

1C: Write Annotation String to Graphics Plane

Writes the specified annotation string to the graphics plane

1D: Plot Gridding, Annotation, and Political Boundaries

Performs the functions of gridding, writing annotation, and drawing the political boundaries

1F: Write Image to Disk

Writes the image to the disk in the current group and updates the image catalog

2A: Draw Grid Lines

Draws latitude and longitude grid lines

2B: Clear Graphics

Clears the active graphics planes

2C: Engrave Graphics

Engraves the active graphics onto the image

2D: Change Defaults

Invokes the GRIDDYN tutor to allow the alteration of gridding parameters

2F: Help

Lists IIS button functions

3A: Select New Image

Presents image directory list for new image selection

3B: Toggle Graphics Plane

Toggles graphics plane on/off

3C: Write Grey Values

Writes the grey values to a GEMPAK grid file

3F: Exit

Exits the MAPGRID program

PROGRAM MAPIMG

Remap an Image to Map Coordinates

FUNCTIONAL DESCRIPTION

MAPIMG remaps image data to any of 9 map projections supported by GEMPAK including the GOES projection. Currently, only radar and GOES satellite images can be remapped. The output image is created on either the disk or the image terminal.

Note on using the GOES projection. When using the GOES projection to map to, the name of a GOES image is required. The image supplied and its associated navigation file must reside on the default directory used. The image name (without directory) is placed in the GAREA parameter and the projection is 'AOI'.

Note on placing a map on the map projection images. GEMPLT assumes a margin of 3 character lines (which depends on character size) when plotting a map. The images created by MAPIMG have no margin. Thus, unless special care is taken, a GEMPLT map will not lie correctly over the remapped image. In order to draw a map correctly, do the following procedure,

1. Exit GEMPLT. Do this by running GPEND. This step may be omitted if it is certain that GEMPLT was not invoked previously in the current session.
2. Set zero text size. Tutor GPTEXT and make sure
TEXSIZ = 0
3. Set up the projection and bounds. You must remember the map bounds chosen for this remap. Tutor on GPSETUP
4. If the data is in the Eastern Hemisphere, you may have to set up a different map. Tutor on GPMFIL. The file GP\$MAPS:MEPOWO.GSF will do political boundaries over the whole world with medium resolution.
5. Plot the map. Tutor on GPMAP. Finis.

PROGRAM DESCRIPTION

MAPIMG TUTOR

PARAMETER	DESCRIPTION
DISDIR	Disk-directory location of files
GAREA	GEMPAK lat, lon range low;left;up;right (or img name)
PROJ	Map projection to map to (MER, NPS, LCC, MCD, AOI ...)
IMGSRC	Source of input image to remap (IAT or DISK)
DEVICE	Output device for image (DISK, IAT or BOTH)
SHNAM	Short name for image
LNNAM	Long name for image
CLDHGT	Cloud Height (KM) (Satellite Images Only)

DISDIR is the disk-directory location of the input image and output remapped image. It is also used for the input GOES image if remapping is done to GOES projection

GAREA is the latitude, longitude area in which to map the image data. It is in GEMPAK format :

<lower latitude>;<left longitude>;<upper lat.>;<right long.>
with latitudes and longitudes in the units of degrees
(For example, 30.;-90.;45.;-70. covers the eastern U.S.).

If PROJ is "AOI" then GAREA is the name of a GOES image to which the image data will be remapped. The GOES image must be in the default disk/ directory.

PROJ is the map projection to map the image data into. There are 6 projections that GEMPLT handles:

MER	Mercator
UTM	Universal Transverse Mercator
NPS	North Polar Stereographic
SPS	South Polar Stereographic
LCC	Lambert Conic Conformal
LCC	Lambert Conic Conformal Southern Hemisphere
CED	Cylindrical Equidistant
MCD	Modified Cylindrical Equidistant
AOI	GOES image projection

IMGSRC is the source of the input image which will be remapped. The input image may either be a dynamic image on the IAT ("IAT") or it can be a disk resident image ("DISK").

DEVICE is where the created image will reside. It may be "IAT" for the image terminal, "DISK" for a disk file or "BOTH" for both the image terminal and disk file.

SHNAM is the short (8 character) name given to the image created.

LNNAM is the long (48 character) name given to the image created.

CLDHGT is the height in kilometers at which the satellite image is to be remapped. This parameter accounts for parallax due to the clouds being at some altitude above the earth's surface and the viewing angle of the satellite. **CLDHGT** is only relevant to GOES satellite images.

PROGRAM NAV

Navigated Cursor for Satellite, Radar, Aircraft,
and GEMPAK projection images

FUNCTIONAL DESCRIPTION

NAV provides navigation information satellite, radar, aircraft or, GEMPAK projection images. The image to be navigated must have correct image geometry and navigation information stored in the image file, or attached to the image file by a conventional link mechanism.

Geosynchronous satellite images (EVISSR, WVISSR, GMS, METSAT), raw SSM/I images, radar images, (BSCAN, PPI, CAPPI, or RHI), or aircraft images (AMMS, MCR) can be navigated upon, provided that they have corresponding navigation data associated with them. AOIPS produced GEMPAK projection images can also be navigated on.

PROGRAM DESCRIPTION

NAV TUTOR

PARAMETER -----	DESCRIPTION -----
INIMAGE	Name of IAT image to be navigated

INIMAGE is the name of the IAT image to be navigated. The default is a null string. This produces an IMAGE LIST DIRECTORY from which to select an image for navigation.

The following IIS button board appears after the dynamic tutor when a satellite image is to be navigated:

	A	B	C	D	F
3	TV to Earth	Earth to TV	Master to TV	Sub- satellite point	Exit
2	Change height	Cursor on	Cursor off	Graphics on/off	Help
1	Reselect image	Write bright cursor	Write dark cursor	Reset cursor	

SATELLITE NAVIGATED CURSOR BUTTON BOARD

1A: Reselect image

Selects a new image from the IAT image list

1B: Write bright cursor

Writes (andgate) a bright cursor (grey value - 255) to the
satellite image

1C: Write dark cursor

Writes (andgate) a dark cursor (grey value - 0) to the
satellite image

1D: Reset cursor

Sends cursor to line 256 and pixel 256

2A: Change height

Changes the height used for the earth location calculations
The default is 0.0 KM

2B: Cursor on

Turns the cursor on

2C: Cursor off

Turns the cursor off

2D: Graphics on/off

Toggles the graphic planes on/off

2F: Help

Lists information on the CRT for using NAV
with satellite images

3A: TV to Earth

Provides earth location (latitude and longitude)
of the feature defined by the cursor

3B: Earth to TV

Provides image location (line and pixel) of the location
(latitude and longitude) entered via the CRT

3C: Master to TV

Sends the cursor to the TV coordinates corresponding to
the master line and pixel values entered via the CRT

3D: Subsatellite point

Provides the subsatellite point for the GOES satellite

3F: Exit

Exits the NAV program

The following IIS button board appears after the dynamic tutor
when a raw SSM/I image is to be navigated:

	A	B	C	D	F
3	TV to Earth	Earth to TV			Exit
2		Cursor on	Cursor off	Graphics on/off	Help
1	Reselect image	Write bright cursor	Write dark cursor		

SSM/I DATA NAVIGATED CURSOR BUTTON BOARD

1A: Reselect image

Selects a new image from the IAT image list

1B: Write bright cursor

Writes (andgate) a bright cursor (grey value = 255) to the

SSM/I image

1C: Write dark cursor

Writes (andgate) a dark cursor (grey value = 0) to the SSM/I image

2B: Cursor on

Turns the cursor on

2C: Cursor off

Turns the cursor off

2D: Graphics on/off

Toggles the graphic planes on/off

2F: Help

Lists information on the CRT for using NAV with SSM/I images

3A: TV to Earth

Provides earth location (latitude and longitude) of the feature defined by the cursor

3B: Earth to TV

Provides image location (line and pixel) of the location (latitude and longitude) entered via the CRT

3F: Exit

Exits the NAV program

The following IIS button menu appears when a radar BSCAN, PPI, CAPPI, OR RHI image is to be navigated:

	A	B	C	D	F
3	TV to Earth	Earth to TV	Range/ azimuth to TV	Distance/ azimuth to TV	Exit
2	Radar Station	Cursor on	Cursor off	Graphics On/off	Help
1	Reselect Image	Write Bright Cursor	Write Dark Cursor	Reset Cursor	

RADAR NAVIGATED CURSOR BUTTON MENU

1A: Reselect image

Presents image selection list for new image selection

1B: Write Bright Cursor

Engraves active cursor (grey value = 255) onto image

1C: Write Dark Cursor

Engraves active cursor (grey value = 0) onto image

1D: Reset Cursor

Resets cursor to center of screen

2A: Radar Station

Moves cursor to location of radar station

2B: Cursor On

Turns on cursor (bit plane 7)

2C: Cursor Off

Turns off plane cursor (bit plane 7)

2D: Graphics On/off

Toggles graphics planes 1-6 on/off

2F: Help

Lists information on the CRT for using NAV with radar images

3A: TV to Earth

Converts current screen coordinates of cursor to earth location (latitude/longitude, height, range or distance, etc.)

3B: Earth to TV

Moves cursor to earth location (latitude/longitude in DDMSS format) entered via CRT (not available for RHI)

3C : Range/azimuth to TV

Moves cursor to range/azimuth location (km/degrees format) entered via CRT (not available for RHI)

3D: Distance/azimuth to TV

Moves cursor to distance/azimuth location (km/degrees format) entered via CRT (not available for RHI)

3F: Exit

Exits the NAV program

The following IIS button menu appears when an aircraft image is to be navigated:

	A	B	C	D	F
3	TV to Earth	Earth to TV	Nav. Data-set Line to TV	Scan Time to TV	Exit
2	Image Line/pixel to TV	Toggle Cursor Off/on	Alt. Depth for Unre-mapped Img	Primary List Only	Help
1	Reselect Image	Write Bright Cursor	Write Dark Cursor	Primary & Secondary List	

AIRCRAFT NAVIGATED CURSOR BUTTON MENU

1A: Reselect image

Presents image selection list for new image selection

1B: Write Bright Cursor

Engraves active cursor (grey value = 255) onto image

1C: Write Dark Cursor

Engraves active cursor (grey value = 0) onto image

1D: Primary and Secondary List

Displays both primary list (pixel, line, lat/lon, pressure altitude, angle from nadir) and secondary list (aircraft speed, heading, roll, pitch, yaw) of aircraft navigation parameters

1F: Print Screen

Writes CRT screen display to a list file (ARNAV.OUTPUT) in the current disk/directory location

2A: Image Line/pixel to TV

Moves cursor to location of image line, pixel coordinates entered via CRT (scan line/pixel values)

2B: Toggle Cursor On/off

Toggles cursor (bit plane 7) on/off

2C: Alter Depth for Unremapped Image

Requests new vertical depth for calculation of earth location information (default is height of airplane, producing ground coordinates)

2D: Primary List Only

Displays both primary list (pixel, line, lat/lon, pressure altitude, angle from nadir) of aircraft navigation parameters only (default upon entry)

2F: Help

Lists information on the CRT for using NAV with aircraft images

3A: TV to Earth

Converts current screen coordinates of cursor to earth location (latitude/longitude, height, range or distance, etc.)

3B: Earth to TV

Moves cursor to screen coordinates corresponding to earth location (latitude/longitude in DDMSS format) entered via CRT

3C: Navigation dataset line to TV

Moves cursor to screen coordinates corresponding to
navigation scan line entered via CRT

3D: Scan Time to TV

Moves cursor to screen coordinates corresponding to
scan time entered via CRT

3F: Exit

Exits the NAV program

The following IIS button board appears after the dynamic tutor
when a GEMPAK projection image is to be navigated:

	A	B	C	D	F
3	TV to Lat/Lon	Lat/Lon to TV	Screen to TV		Exit
2	Toggle Cursor	Toggle Graphics			Help
1	Reselect image	Write bright cursor	Write dark cursor		

GEMPAK NAVIGATED CURSOR BUTTON BOARD

1A: Reselect image

Selects a new image from the IAT image list

1B: Write bright cursor

Writes (andgate) a bright cursor (grey value = 255) to the
satellite image

1C: Write dark cursor

Writes (andgate) a dark cursor (grey value = 0) to the
satellite image

2A: Toggle Cursor

Turns the cursor on or off

2B: Toggle Graphics

Turns the graphics planes on or off

2F: Help

Lists information on the CRT for using NAV
with GEMPAK projection images

3A: TV to Lat/Lon

Provides earth location (latitude and longitude)
of the feature defined by the cursor

3B: Lat/lon to TV

Provides screen location (line and pixel) of the location
(latitude and longitude) entered via the CRT

3C: Screen to TV

Sends the cursor to the TV coordinates corresponding to
the screen line and pixel values entered via the CRT

3F: Exit

Exits the NAV program

PROGRAM PLOTBK

Plot Aircraft Flight Track(s) on Radar, Satellite Images,

FUNCTIONAL DESCRIPTION

PLOTBK plots the aircraft nadir flight track and sensor scan limits on a radar CAPPI/PPI, GOES satellite image, or a GEMPAK projection image. The navigation data file is read from the specified aircraft directory and the earth location (latitude/longitude) of the aircraft nadir track and sensor scan limits are plotted in graphics planes on the specified satellite or radar image(s).

PROGRAM DESCRIPTION

PLOTBK TUTOR

PARAMETER -----	DESCRIPTION -----
DIRANV	Disk/directory location for aircraft navigation file
DIRIMG	Disk/directory location for images (satellite/radar/GEMPAK)

DIRANV is the aircraft directory in which the navigation data to be plotted resides. This directory will be the one used if the option 'select new aircraft navigation' is invoked in the IIS button board interface.

DIRIMG is the directory location for the satellite, radar, or GEMPAK projection image(s) on which the aircraft track(s) will be plotted. This directory will be the one used if the options 'write image to disk' or 'select new image' are invoked in the IIS button board interface.

Select an aircraft navigation file to be plotted on radar or satellite images from the AIRCRAFT DATASET DIRECTORY LIST.

AIRCRAFT FLIGHT TRACK PLOTTING PARAMETERS DYNAMIC TUTOR

PARAMETER -----	DESCRIPTION -----
STARTIME	Start time to plot (HHMMSS)
ENDTIME	End time to plot (HHMMSS)
MRKINT	Track marking interval (seconds)
LBLINC	Mark label increment
TPLANE	Bit plane number for track
SPLANE	Bit plane number for sensor scan limits
LPLANE	Bit plane number for labels
GREYENG	Grey level for engraving
NUMPTS	Number of points for navigation filter (odd number)
CLDHGT	Cloud height of interest (kilometers)
ARFALT	Nominal aircraft altitude (kilometers)

STARTIME specifies the beginning time (in HHMMSS) of the flight track to be plotted on the image. The default is set so that the first time available in the file is plotted.

ENDTIME specifies the end time (in HHMMSS) of the flight track to be plotted on the image. The default is set so that the last time available in the file is plotted.

MRKINT specifies how often (in seconds) the aircraft track will be marked with tick marks (a cross). The first mark will appear at **STARTIME** + **MRKINT**. The valid range for **MRKINT** is 30 to 600.

LBLINC specifies how often the tick marks will be labeled. For example, **LBLINC** = 1 labels every tick mark, and **LBLINC** = 2 labels every other tick mark. The valid range for **LBLINC** is 1 to 10.

TPLANE is the graphics plane number on which the aircraft flight track and tick marks will be written.

SPLANE is the graphics plane number on which the aircraft sensor swath limits will be written.

LPLANE is the graphics plane number on which the time labels for the tick marks will be written.

GREYENG is the grey level to be used for engraving the bit plane graphics onto the image(s) in refresh memory.

NUMPTS specifies the size of the running average for

filtering the navigation data. It is an odd number less than or equal to 19. Filtering is sometimes necessary if the navigation corresponds to an aircraft dataset which has relatively coarse temporal resolution. The effect of filtering is to smooth the flight track line. Over-filtering can cause a problem if the navigation dataset contains erroneous values.

CLDHGT is the cloud height for which the scan limits of the swath will be plotted. The default is 0.0 km, meaning that that ground swath will be plotted. The user should enter the cloud height used for remapping aircraft sensor images in order to determine the swath width of the remapped aircraft image on the satellite, radar, or GEMPAK projection images. The valid range for CLDHGT is 0.0 to 20.0 km.

ARFALT is the nominal altitude of the aircraft. This value is needed for determining the swath width of the sensor. The default is 20.0 km, which is the nominal cruising altitude of the ER-2 aircraft. The user should enter the aircraft altitude used for remapping aircraft sensor images in order to determine the swath width of the remapped aircraft image on satellite, radar, or GEMPAK projection images. The valid range for ARFALT is 5.0 to 25.0 km.

The AIRCRAFT FLIGHT TRACK PLOTTING PARAMETERS DYNAMIC TUTOR prompts the user for parameters to be used in plotting the aircraft flight track on a radar, satellite, or GEMPAK projection image. The default values allow the entire flight track in the selected aircraft navigation file to be plotted. A filtering option is available to smooth the aircraft navigation data. The default swath width plotted is the ground swath for an aircraft altitude of 20 kilometers. This program is useful for determining the path of the aircraft relative to features evident on PPI/CAPPI radar data, GOES satellite imagery, or GEMPAK projection images.

The following IIS button menu appears after the dynamic tutor is invoked:

	A	B	C	D	F
3	Engrave graphics onto image	Change graphics defaults	Filter navigation		Exit
2	Toggle label GP on/off	Clear graphics	Select new image	Select new A/C navigation	Help
1	Plot aircraft track	Plot scan limits	Toggle track GP on/off	Toggle scan GP on/off	Write image to disk

PLOTTRK BUTTON MENU

1A: Plot Aircraft Track

Plots aircraft nadir track

1B: Plot Scan Limits

Plots sensor scan limits on either side of nadir track

1C: Toggle Track Graphics Plane (GP) On/off

Toggles graphics plane for aircraft nadir track on/off

1D: Toggle Scan Limits Graphics Plane (GP) On/off

Toggles graphics plane for sensor scan limits on/off

1F: Write Image to Disk

Writes image to current disk/directory location

2A: Toggle Label Graphics Plane (GP) On/off

Toggles graphics plane for tick mark time labels on/off

2B: Clear Graphics

Clears all graphics planes

2C: Select New Image

Presents image selection list for new image selection

2D: Select New Aircraft Navigation

Presents a/c directory list for new navigation selection

2F: Help

Lists functions of IIS buttons

3A: Engrave Graphics onto Image

Engraves active graphics plane(s) onto image

3B: Change Graphics Defaults

Presents dynamic tutor for changing plotting values

3C: Filter Navigation

Filters aircraft navigation

3F: Exit

Exits the PLOTBK program

PROGRAM RADGRID

Plot Distance/range Circles or Azimuth Lines on Radar Images

FUNCTIONAL DESCRIPTION

RADGRID plots distance/range (height on PPI) circles and/or azimuth lines on radar CAPPI or PPI images. The graphics can then be engraved onto the image(s). Images can then be written to the current disk/directory location.

PROGRAM DESCRIPTION

RADGRID TUTOR

PARAMETER -----	DESCRIPTION -----
DIRECTRY	Disk/directory location for radar images

DIRECTRY is the disk/directory location of the radar images to which gridding is to be applied.

Select a radar image for gridding from the IMAGE SELECTION LIST.

The following IIS button menu appears after the dynamic tutor is invoked:

	A	B	C	D	F
3	Select New Image	Toggle GP On/off			Exit
2	Write Annotation	Clear Graphics	Engrave Graphics Onto Image	Change Graphics Defaults	Help
1	Draw Range Circles	Draw Distance Circles	Draw Ht Circles (PPI only)	Draw Azimuth Lines	Write Image to Disk

RADGRID BUTTON MENU

1A: Draw Range Circles

Draws circles of constant range on PPI or CAPPI image

1B: Draw Distance Circles

Draws circles of constant distance on PPI or CAPPI image

1C: Draw Height Circles (PPI only)

Draws circles of constant height on PPI image

1D: Draw Azimuth Lines

Draws radial lines of constant azimuth on PPI or CAPPI image

1F: Write Image to Disk

Writes image to current disk/directory location

2A: Write Annotation

Writes specified annotation to current bit plane

2B: Clear Graphics

Clears all graphics on current bit plane

2C: Engrave Graphics onto Image

Engraves active graphics onto image

2D: Change Graphics Defaults

Re-displays dynamic tutor for changing gridding parameters

2F: Help

Lists IIS button functions for RADGRID

3A: Select New Image

Presents Image Selection List for new image selection

3B: Toggle Graphics Plane (GP) On/off

Toggles graphics bit plane on or off

3F: Exit

Exits RADGRID program

RADAR IMAGE GRIDDDING FUNCTION PARAMETERS DYNAMIC TUTOR

PARAMETER	DESCRIPTION
1_RNGMIN	Minimum range for range circles (km)
2_RNGMAX	Maximum range for range circles (km)
3_RNGINC	Increment between range circles (km)
4_AZSTAR	Starting azimuth for azimuth lines (deg)
5_AZEND	Ending azimuth for azimuth lines (deg)
6_AZINC	Azimuth increment between azimuth lines (deg)
7_DISMIN	Minimum distance for distance circles (km)
8_DISMAX	Maximum distance for distance circles (km)
9_DISINC	Increment between distance circles (km)
A_HTMIN	Minimum height for height circles (km) (PPI only)
B_HTMAX	Maximum height for height circles (km) (PPI only)
C_HTINC	Increment between height circles (km) (PPI only)
BPLANE	Bit plane number for gridding
GREYENG	Grey level for engraving
ASTRING	Annotation string
LINANNOT	Starting image line for annotation string
PIXANNOT	Center image pixel for annotation string
SIZANNOT	Size of annotation (pixels)

1_RNGMIN is the minimum distance (in kilometers) of the range circles to be plotted on a PPI or CAPPI image.

2_RNGMAX is the maximum distance (in kilometers) of the range circles to be plotted on a PPI or CAPPI image.

3_RNGINC is the distance increment (in kilometers) of the range circles to be plotted on a PPI or CAPPI image.

4_AZSTAR is the starting azimuth for which range/distance or height (PPI only) arcs and azimuth lines will be drawn. Note that the sector is always drawn in a clockwise sense.

5_AZEND is the ending azimuth (in degrees) of the

azimuth lines to be plotted on a CAPPI or PPI image.

6_AZIN is the azimuth increment (in degrees) of the azimuth lines to be plotted on a CAPPI or PPI image.

7_DISMIN is the minimum distance (in kilometers) of the distance circles to be plotted on a CAPPI or PPI image.

8_DISMAX is the maximum distance (in kilometers) of the distance circles to be plotted on a CAPPI or PPI image.

9_DISINC is the distance increment (in kilometers) between distance circles which are plotted on a CAPPI or PPI image.

A_HTMIN is the minimum height (in kilometers) of the height circles to be plotted on a PPI image.

B-HTMAX is the maximum height (in kilometers) of the height circles to be plotted on a PPI image.

C_HTINC is the increment (in kilometers) between height circles which are plotted on a PPI image.

BPLANE is the bit plane on which the gridding lines and annotation are to be written. Valid bit planes are from 1 to 7.

GREYENG is the grey level to be used for engraving the bit plane graphics onto the radar image.

ASTRING is the character string (maximum 80 characters) to be annotated on the radar image.

LINANNOT is the starting line for the annotation string.

PIXANNOT is the image pixel around which the annotation string will be centered.

SIZANNOT is the size in pixels of the annotation string.

The RADAR IMAGE GRIDDING FUNCTION PARAMETERS dynamic tutor prompts the user for parameters to be used in performing plotting of distance/range circles or azimuth lines on PPI or CAPPI radar images.

The sector drawn is always selected in the clockwise sense. For example, a starting azimuth of 10 degrees and ending azimuth of 50 degrees will produce the 40-degree sector from 10 to 50 deg. A starting azimuth of 50 degrees and ending azimuth of 10 degrees will use the 320 degree sector from 50 to 10 degrees.

The parameter names have leading numbers or letters followed

by an underscore (_) to allow ease of use in changing their values.

5.13 System Utilities

PROGRAM ASNEWS

Display AOIPS Software System News

FUNCTIONAL DESCRIPTION

ASNEWS displays the AOIPS news file containing the latest system news and information. ASNEWS is automatically invoked upon entry into AOIPS.

PROGRAM ASWHAT

Display Current AOIPS System Global Variables

FUNCTIONAL DESCRIPTION

ASWHAT displays the current AOIPS software system global variable values. ASWHAT allows verification of the settings at any time during a work session.

PROGRAM DISKS

List Available Disks

FUNCTIONAL DESCRIPTION

DISKS shows the available disks on the system by listing the AOIPS disk information table.

PROGRAM MENUTREE

Display Menutree

FUNCTIONAL DESCRIPTION

MENUTREE lists all sub-menus and programs starting with a given menu. The output is in the form of a branching vertical tree, with the first menu on the upper left and all others leading off from it. The tree branches out another column for each menu nested within another, and branches back whenever a menu is completely processed. If a branch goes off the page, it is picked up at the end of the listing and continued from there. Except in case of error, the leaves of every branch are either commands or programs.

PROGRAM DESCRIPTION

MENUTREE TUTOR

PARAMETER -----	DESCRIPTION -----
MENU	Name of the menu to be listed
OUTPUT	Output destination

MENU is the name of the menu file where the tree is to begin. It may be fully qualified in which case the hierarchy search is bypassed. If no logical or directory specification is made, the menu is searched for using a standard menu hierarchy search, \$USERLIB followed by \$APLIB followed by TAE\$MENU.

The default value is the top of the menu tree currently being used, which is defined as the first value of the \$MENUS global.

The tree generated can be sent to various places. The options are:

- . FILE - Creates a file called "MENUTREE.TXT" in the user's default directory
- . PRINTER - Prints to the system line printer
- . TERMINAL - Displays the tree on the terminal

PROGRAM PRINTER

Set Default Printer For AOIPS

FUNCTIONAL DESCRIPTION

PRINTER sets the default printer to be used for output by the AOIPS software. When running AOIPS from a microVAX, the default printer should be set to a printer connected to a terminal server.

PROGRAM DESCRIPTION

PRINTER TUTOR

PARAMETER	DESCRIPTION
PRINTER	Printer Queue Name (type "Help Printer" for List)

QUEUE is the QUEUE name of the desired default printer.
Valid queue names are:

QUEUE	DEVICE	DESCRIPTION	LOCATION
SYS\$PRINT	LPA0:	System Printer	Rm. 111
LAT\$LA100	LTA100:	LA100 Printer	Rm. 323
LPC0	LPC0:	QMS Laser Printer	Rm. 323
TTA0	TTA0:	Digital LNO3 Laser Printer	Rm. 334
TTB0	TTB0:	Macintosh Laser Printer	Rm. 323
SYS\$SPINWRT	TTF5:	Spinwriter	Rm. 111
LTA8	LTA8:	QMS Laser Printer	Rm. 371
&F\$VRSTC	LPB0:	VERSATEC device	Rm. 111

Note: When running AOIPS from a microVAX, the default printer should be set to a printer connected to a terminal server.

PROGRAM REPORT

Report Problems and/or Enhancement Requests

FUNCTIONAL DESCRIPTION

REPORT is used to report observations, change requests, or problems during TAE sessions on the AOIPS computer system. The report is routed through MAIL by the system (selected by subcommand) and reported on to the appropriate account(s) for investigation and resolution. A copy of the report is also routed to the sender.

REPORT invokes the VAX/VMS EDITOR/EDT in the "change" mode (keypad mode on the VT100) to create a file that is sent to the appropriate accounts using the VAX/VMS MAIL. A file (mail.tmp) is used and then deleted after sending.

Format: TAE>REPORT-SUBCOMMAND SUBJECT-program_name

Valid Subcommands

TAE	TAE Report
GEMPAK	GEMPAK S/W Report
METPAK	AOIPS S/W Report
DMS	DMS S/W Report
HARDWARE	Hardware report
UNKNOWN	Unknown category report

Report Documentation Page

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15. Supplementary Notes S.S. Schotz and T.S. Piper - General Sciences Corporation, Laurel, Maryland; A.J. Negri - Goddard Space Flight Center, Greenbelt, Maryland.					
16. Abstract This document is Volume II of the Atmospheric and Oceanographic Information Processing System (AOIPS) User's Guide. AOIPS 3 is the version of the AOIPS software as of April 1989. The AOIPS software was developed jointly by the Goddard Space Flight Center and General Sciences Corporation. Volume II presents a detailed description of every AOIPS program. It is intended to serve as a reference for such items as program functionality, program operational instructions and input/output variable descriptions. Volume I of the AOIPS User's Guide is intended to serve as a general reference to the AOIPS system. Program descriptions are derived from the on-line help information. Each program description is divided into two sections. The FUNCTIONAL DESCRIPTION section describes the purpose of the program and contains any pertinent operational information. The PROGRAM DESCRIPTION section lists the program variables as they appear on-line, and describes them in detail.					
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